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DISSERTATIONS  
ON  
INFLAMMATION.

VOLUME I.

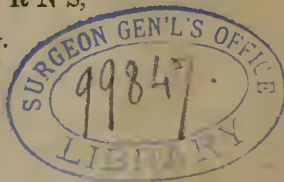
CONTAINING,

PRELIMINARY DISSERTATION—ON SOME OF THE LAWS OF THE  
ANIMAL ECONOMY. DISSERT. II—ON THE HISTORY, CAUSES,  
AND CONSEQUENCES OF SIMPLE INFLAMMATION.

~~WAS DESTROYED~~

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## P R E F A C E.



THE foundation on which medical reasonings are built, is a knowledge of the laws and operations of the living principle ; but as our acquaintance with these is exceedingly imperfect, the opinions which are formed from this must be fluctuating, and frequently very uncertain.

When physic first became a science, the doctrines of its teachers were, of necessity, rude and chimerical ; and even after it had been studied for many hundred years, it continued to be obscured by a multitude of idle theories. As these were founded not on facts, but on what the imagination of their inventors believed to be probable, it is not wonderful, that each succeeding teacher should change and modify the doctrines of his predecessor : But even these changes, however highly they might be valued by the school which effected them, embraced only a very small extent. The more trifling parts of the system alone suffered an alteration ; and the great outlines of former opinion seemed to be beheld, for ages, as boundaries marked out by a Superior Being to the human under-

standing, and marked with the characters, Hitherto shalt thou come, but no farther. For by far the longest period of medical history, we find these outlines to be drawn on a wrong foundation; the principles of pathology being taken from the properties and conditions of the different fluids of the body. In the first ages of knowledge, the mind was impressed with material objects alone, and was able to reason only concerning objects of sense. That the grosser part of matter must have some more subtle power acting on it, in order to make it perform its operations, appeared evident to all; but of this they could form no idea, otherwise than by supposing an intelligence which, by its active qualities, could operate just as man moves and regulates the machines which he makes. The nature of this intelligence they also endeavoured to explain; but, by having their minds tied down wholly to material objects, the ancient philosophers could form no conception of a principle purely spiritual. They, therefore, chose the most subtle matter with which they were acquainted; and believed heat, or a principle to which they gave this appellation, to be the soul of the universe, from which emanations went forth to enliven the individuals of the creation. Such being the doctrines of the philosophers, medical reasonings came naturally to be founded on the properties and changes of the material part of the frame, which changes were again referred to the operation of an intelligent and sentient principle.

It was the discoveries of the immortal Newton, which first paved the way for the real improvement of medical science ; for he, in one great branch of natural knowledge, banished completely the mechanical interference of intelligent agents, and taught the existence of a principle purely immaterial, and which, without any wisdom or volition, could act by being acted on. The mind now came gradually to be weaned from reasonings totally material and mechanical ; and physicians, by degrees, began to attribute the operations of the animal frame, not to a thinking power, which presided with wisdom over the system, but to a principle, which was implanted in man at his creation, and which, through the medium of the nerves, in which it was supposed to be lodged, carried on his functions, according to a rule established from the beginning, without possessing either knowledge or judgment. It required, however, a step farther to banish the doctrines of the changes of the fluids, and the belief in these as the cause of disease ; and so strongly have these notions taken hold of the mind, that they are not yet altogether given up.

An examination into the properties and source of this living principle, or nervous energy, as it has been called, forms the subject of the Preliminary Dissertation, in which I have endeavoured to explain some of the principal laws and operations of the animal economy. The subsequent Dissertations contain an inquiry into the nature and mode of treatment of some of the different species of in-

flammation, founded upon those laws or properties of the living principle. These are part of a course of lectures which I read upon surgery, three years ago, in the Royal Infirmary, in Glasgow.

I offer them now to the Public with much diffidence ; but, at the same time, with a sincere hope that they may be useful to others, in considering the same subjects, which are of the very first importance to every surgeon. If, in any part, I shall appear to be unnecessarily tedious, I beg it to be remembered, that some of these positions differ from those commonly maintained, and, therefore, require to be more fully illustrated. I do not write to surgeons who already understand these subjects, but to students, who as yet have their knowledge to acquire, and to whom many illustrations are useful, which to others, who know more, may appear to be unnecessary.



DISSERTATIONS  
ON  
INFLAMMATION.

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PRELIMINARY DISSERTATION ON SOME OF THE LAWS OF  
THE ANIMAL ECONOMY.

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*Introduction.*

NATURAL historians have divided the objects of their examinations into three great classes, which have been called the kingdoms of nature ; the animal, the vegetable, and the mineral.

Amongst all the different individuals of these divisions, an organised form regularly prevails. A stone or a salt assumes uniformly an appearance which continues always the same in similar species. The vast rocks of Basaltes, which stand as so many monuments of the dreadful cause which produced them, consist of large pillars, having five sides of equal dimensions. Silicious crystals exhibit the form of hexagonal pyramids, whilst the zeolite assumes the figure of a beautiful star, and the amianthus that of regular and parallel fibres.

The vegetable has likewise its appropriate construction, which, as in the other kingdoms, continues always the same ; but in this respect it differs from the mineral, that to a regular figure there are conjoined organic vessels to maintain and

increase that form, according to the uniform action of a certain principle which they possess, and which has been called life. If the plant be cut through level with the earth, we soon find that the loss is supplied, and new sprouts formed, which produce leaves, flowers, and fruit, exactly similar to those which were cut down. If we apply a stimulus to it, a particular effect is produced, according to the nature of the application, or of the part acted on. If it be light, the organs of motion become affected, and the leaves turn toward the ray, or the flower-leaves open to admit the light and air to the parts of fructification. If heat be applied to the plant, in a slow and regular manner, it supports and assists the exercise of its functions, and consequently contributes to its strength and increase. But if it be applied hastily, and to a great degree, it disorders the action of that power which preserves the plant, and either disease or death is the result. The laws and operations of this power are few and simple; but when we ascend to the animal creation, we find, that not only the structure is more complex, but also the modes of action are much more numerous.

The individuals of the last class have promiscuously received the name of dead matter, because, when compared with the other classes, they appeared to be inanimate. But by a more accurate examination, we shall find, that there is in reality no individual whatever in any of the kingdoms or classes of nature which can be called inert, or truly dead. For, from the largest masses of matter down to the most minute corpuscles, we distinctly perceive the operation of an active and immaterial principle.\*

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\* The particular nature of this principle, as we shall afterwards see, never can be ascertained. We are, however, sufficiently assured, by the phenomena which we observe, that in all the classes of nature such a principle does exist. But the relation which the enlivening or vital powers of one class bears to that of another, cannot yet, if ever, be determined. Whether the same principle only exists in different degrees of perfection in these classes, or whether its nature be essentially different in each, will admit of much discussion. In this paper, however, I can only give a general statement of the idea which I annex to the principle of life, and

This principle has received different names, according as it manifests itself. The power which supports the functions, (if I may use the expression,) and regulates the motions and actions of the different parts of the universe, has been called gravitation; whilst the property which makes one particle unite with another, and which modifies the form, and produces the increase of the smaller bodies, has received the name of corpuscular attraction. The principle, again, which regulates the intestine changes, and determines the combinations and specific states of existence in matter, has been denominated elective, or chemical attraction.

How matter, which by itself, and viewed abstractedly, must be considered as inert and dead, should be capable of combining with this active and immaterial power, it is impossible to say. But having from the creation perceived this union, we find it to be now impracticable to form a conception of matter unconnected with this property.

Without this enlivening principle, all nature must be dead; and matter deprived of it must either cease to exist, or exist in a way which we cannot possibly comprehend. The union of the whole universe must be dissolved, and the beautiful dependence of one part on the rest for ever destroyed. We know, and are taught to believe, that the Great Being who formerly sent forth this active vital power, and bade the worlds live, will one day recal his gift. Matter shall then cease altogether to be, or shall return to that unknown chaotic state which poets have imagined, and vainly attempted to describe.\* The particular laws and operations of attraction,

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afterwards mention, in so far as will be necessary for understanding the following *Dissertations on Inflammation*, some of the operations and qualities of the living principle in man.

- \* "Ante, mare et tellus, et, quod tegit omnia, cælum,  
 "Unus erat toto naturæ vultus in orbe,  
 "Quem dixere chaos; rudis indigestaque moles;  
 "Nec quicquam, nisi pondus iners; congestaque eodem  
 "Non bene junctarum discordia semina rerum."

or the life of matter, belong for investigation to the natural philosopher ; and therefore it will here only be proper to remark, that I consider animals, vegetables, and what is called inanimate matter, as all possessing an immaterial principle, differing greatly indeed in its nature and effects in these different classes, but still deserving, in all of them, the name of life, being of equal value to each, and absolutely requisite for their preservation.

This power, we have seen, is exceedingly simple in common matter ; but when we mount to the next class, that of vegetables, we find a much greater degree of perfection in the life, and much more complicated actions. We have not only the same properties which are possessed by matter, but also additional and very surprising powers. We find them always in a progressive state of growth or decay, endowed with the property of changing foreign matter into a peculiar fluid, which is continually circulated through their vessels, and converted into a great variety of products. They are farther distinguished, by having within themselves the powers of motion, and of multiplying their species to an endless degree. We then find, that vegetables possess not only the principles proper to matter, but also a life peculiar to themselves, and which, I may say, is built upon the former ; for without attraction there can be neither growth nor organization.

When we ascend to animals, we find them possessed of a third species of life, built upon the other two. In this class, beside attraction, or the preserving and active principle of matter, we find reproduction, and the other properties of vegetable life ; but these properties are exhibited with a different modification, and are united with others, which of themselves would, independent of the presence of mind, distinguish them from vegetables.

We have, then, in the three classes of nature, three different species of life, each more perfect than the other, and increasing gradually in their delicacy and intricacy. The most simple, or that of matter, is the most permanent, and on it the other two are built. I do not, however, mean from this to say, that attraction,\* or the vital principle of matter, acts in the higher classes merely as attraction; or, in other words, that it remains unchanged in its properties. On the contrary, a very great alteration takes place; and, although it still possesses the quality expressed by the word attraction, making the parts adhere together, it yet is so far changed and perfected, as to exhibit many other phenomena and new actions, of which, before this elevation, it was incapable. It is rendered not only more perfect, in this respect, of gaining new properties, but even its original quality of producing attraction is much improved; for a living muscle will bear a greater weight, without laceration, than one newly dead, or one called, in common language, dead; which proves, that the vital principle, in animals, has a greater power of producing the effect called attraction, than the vital principle of common matter.

The three classes run imperceptibly into each other; and thus we have a complete chain of existence established, from the most simple to the most complicated body. Those species of amianthus, which are called mountain cork, although minerals, yet resemble vegetables so strongly, that they link the classes together; whilst the coralines, although animals, resemble both minerals and vegetables. The fungi, though plants, consist of the same principles with animals. Some of the fuci resemble hair, and other cartilage; whilst the sponge, although an animal, grows like a vegetable. Not only the external and chemical qualities, but also the vital

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\* This term is used sometimes for the cause, and sometimes for the effect; but the sense will always show how it is to be understood.

principle, and its phenomena, form a regular gradation in the different classes. Even in a single individual of the two higher classes, we perceive the gradual elevation of one species of life into another. This change uniformly begins in the fluid part of the individual. In the plant, the first change produced on common matter, or the aliment, is its conversion into vegetable juices, which exhibit certain vital phenomena, different from common fluid matter : afterwards organization is added, in which the vegetable life is exhibited with most perfection. In animals, again, there is a greater gradation, and more complicated change, before animal life be imparted in its greatest perfection. The food is first converted into chyle, which has a lower species of life than the blood, which again is more imperfect in its vitality than the organized parts. The living principle of the blood differs, both in degree and kind, from that which belongs peculiarly to the animal; but these two are connected, and react on each other.

No substance or piece of matter, whether simple or compound, has of itself a tendency to decomposition, or change of state. For effecting this, the principle of attraction must be acted on by the addition of other substances, and then a new condition will take place. This is the foundation of chemistry, which is a science wholly built on the effects of attraction. Some have attempted to explain the changes or diseases of living animals by the same laws ; but this method cannot be admitted, until it be proved, that their life does not give them properties different from common matter, and make them subject to another set of laws. When they are deprived of this life, then they become liable to the habits of matter, and may, by the agency of other substances, be decomposed, and differently combined ; but, until their specific life be lost, they bid defiance to such changes ; and, therefore, the system of pathology which has been built upon it must be false.

Life is a principle which we can only detect and judge of by its operations or actions ; and, when these are not exhibited, we are apt, though sometimes erroneously, to conclude, that the body is dead. The leading property of life, is to communicate a preservative power to every individual with which it is connected. This is sometimes effected by very evident and intricate actions ; but, at other times, is exerted without any sensible operation. The crystal resists, to a certain degree, mechanical impressions, which would destroy its form. The blood when newly drawn, the sap of vegetables, the living egg, resist cold, by an imperceptible operation, to a much greater degree, when alive, than after their peculiar life departs. They resist all the efforts of chemical agents which act on common matter ; nor is it possible to decompose or injure them in this way, until they lose their specific life, and descend in the scale of existence. This simple preservative power is a discriminating mark of the presence of life ; but we cannot detect it until we apply destroying causes : It is the uniform and universal effect of the combination of life with any substance, whatever its nature or structure may be : It is the essential characteristic of life, which it must show whenever it is present. But, when we find vital power united with a certain organization,\* then more varied phenomena take place ; and these are called actions of the vital principle.† In the plant, the bud expands, the stem shoots up, the food is absorbed, digested, and circulated ; air is thrown out, and particular secretions take place. In the animal, these actions are still more evident, but more intricate, and infinitely more varied. They are the support of our health, and the source of all our disease.

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\* I am only here considering animal life, without any connection with an intelligent principle or soul, which is quite a different thing from vitality.

† Every operation of the vital energy is called an *action*, and whatever agent excites this action is called a *stimulus*. The aptitude of the system to be acted on has been expressed by the term *irritability*.

In the two first classes, the enlivening principle seems to be equally united with and dependent on every part ; but in animals, to whom I will now confine my attention, the principle which performs these actions is more directly connected with certain organized portions of the body, called brain and nerves, which supply every part, though so minutely, that we often cannot trace their course.

### *Of the Brain and Nerves.*

The brain\* is a soft globular substance contained within the cranium, of a dusky colour without, but white in the centre. It is from this white or medullary portion, that we find all those elongations arising, which have been called nerves, and which are just portions of the brain diffused over the body, and exerting there the peculiar properties of the system to which they belong.

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\* Were we to proceed regularly to investigate the various phenomena of animal life, we would naturally begin by examining the composition and structure of the different parts of the body. By this examination, we should become acquainted with some fundamental facts, but should still be in the dark with regard to that principle which animates the whole, and enables the various functions to be carried on. An inquiry into the general laws of this energy, which is found to reside in the brain and nervous system, would, therefore, naturally become the second object of our attention. Being acquainted with these, we would next examine the particular functions of man, and the operation of the nervous energy in supporting them. The gradual growth and increase of the animal, the deposition of new matter, and the absorption of the old, would be the first subject of consideration in this part of the examination, and would naturally involve an inquiry into the process of digestion, and the formation of the blood, with its qualities and uses. The powers of motion, the influence of the mind, and the history of the different senses and various functions of man, would conclude this part of the inquiry. Having become acquainted with the healthy condition of the system, and the causes which maintain it, we would apply this knowledge to the investigation of the different derangements, or diseased actions of our body, and their cure.

Such might be a proper plan for examining regularly the economy and diseases of an animal; but this would be greatly too extensive for the present purpose. It must here be taken for granted, that the student is acquainted with the structure of the body, and with its different functions, by which he will be able to understand the following general observations on the properties of the living principle, and apply the doctrines more particularly himself.

These nerves possess different qualities, according to the portion of the brain from which they arise, and the organism of the part to which they go. Those which go out first, arising from the mamillary processes, and which are called olfactory nerves, are the source of the sense of smelling. The second pair, arising from a particular protuberance, or little brain, called the optic bed, give the important sense of seeing ; and, in order to connect those two cerviculæ, or beds, we find their elongations joined, before they proceed out of the skull. The third, the fourth, the first branch of the fifth, and the sixth pair of nerves, all arise from the cerebrum, and are distributed on the different parts of the eye, serving chiefly for the purposes of motion. The soft portion of the seventh pair arises from the fourth ventricle, and constitutes the auditory nerve. None of these nerves support the vital functions ; they are all destined either for the organs of sense, or the simple parts about the head.

The nerves which serve for carrying on the vital functions, all arise either from the medulla oblongata, or spinal marrow. I have seldom, in dissections, found derangements of those parts of the brain, but have often observed very great disease in the cerebrum. In one case, the cerebrum was hard and schirrus, but the cerebellum was sound and healthy. This man died comatose, after being long tormented with violent head-aches. In another instance, although the lateral ventricles were so much distended with water, that the hemispheres of the brain were converted into little else than two bladders full of fluid, yet the child was sensible nearly to the time of death, which was produced more by the pressure on the cerebellum, which was not diseased, than by the derangement of the cerebrum. In numberless instances, we find the skull beat in upon the cerebrum, or foreign bodies lodged in its substance, or abscesses formed in consequence of blows and falls, and still the patient

surviving all the injury.\* The physiologist has even removed this part of the brain altogether, in birds and other animals, without death being occasioned; the senses alone were destroyed. But it is equally well attested, that the cerebellum cannot be injured with the same impunity; for, from the history of those who are killed by blows on the head, and by experiments upon brutes, we find, that, in very few instances, does the animal survive, if this part of the brain be injured.†

We shall next find, that the cerebellum, comprehending its production, the medulla oblongata,‡ joined by a few branches from the cerebrum, is expanded or diffused over the whole body. It passes out of the skull, and seeks defence in the vertebral canal, from whence it sends out elongations to all the different parts of the body, which, with those which pass out from it in the skull, support the existence of the animal.

\* I do not mean to maintain, that wounds of the cerebrum are not attended with great danger. I only wish to prove, that they are by no means so fatal as those of the cerebellum; and, consequently, that the cerebrum is not so immediately necessary to the continuance of life. Spindler, and others, report instances of people walking about with part of the cerebrum gangrenous. Many instances of recovery from severe injuries done to this part, are mentioned in the Memoirs of the Academy of Surgery; and every practical surgeon must have observed, how long a patient often survives the most terrible accidents of the head.

† Although Zinn, Fallopius, Veslingius, and others, consider wounds of the cerebellum as curable, and have cured individuals who were supposed to have this part of the brain injured; and although the illustrious Baron Haller mentions, that he had once seen the cerebellum schirrus; yet the observation of Bohnius, and others, who have wrote expressly on the subject, that these wounds are almost inevitably fatal, cannot be considered as invalidated by those solitary instances of recovery.

‡ The medulla oblongata is just a part of the cerebellum, and is of the same importance to the living system. We see it supporting life in insects, who are without a brain, and in acephalous monsters. Wounds of it are fatal and dangerous, in proportion as they are near the head; or, in other words, according to the value of the nerves which originate beneath them.

These elongations,\* or nerves, possess a degree of energy, or vital power, in themselves, independent of what they receive from the brain as their source. They are neither more nor less than continuations of the brain, possessing the same power, and endowed with a similar quality. It would, indeed, from reflection, independent of experiments, be reasonable to conclude, that the nervous energy must be diffused over all the body, although it resides in a greater proportion in the brain, from whence it is sent to support the other parts of the system. In general, the quantity of energy in a nerve is proportioned to its size; it is greatest in the brain, and less in all the elongations, in a degree correspondent to their magnitude.† The small nerves have a dependence upon the great, and these again upon the brain: An universal connection is thus established, no one part of the body being of itself sufficient for living.‡

The delicacy of the nervous system is proportioned to the perfection of the animal; and, therefore, it is chiefly by experiments on the individuals of the lower ranks, that this doctrine is to be confirmed. At the same time, some assistance may be derived from what we occasionally observe in the more perfect animals. We find, for instance, that children

\* Aristotle believed, that the nerves originated from the heart; and his successors taught, that the blood-vessels which proceeded from the heart, were converted, in the brain, into nerves. It is on this account, says Van Horn, that in anger, the blood boils, and the eyes flash with fire.

† We must carefully distinguish betwixt energy and action, which do not always correspond. The brain, which most likely contains the greatest quantity of energy, considered absolutely, exhibits less action than many small nerves; for I do not consider the operations of the mind as an action of the nervous energy in the brain. Mind and nervous energy are totally different; and, once for all, I beg to mention, that I consider the soul or spirit as distinct, and altogether out of the present question concerning vital power, and its actions.

‡ Although the inherent quantity of energy appears to correspond to the quantity of nervous medulla, yet the action does not, being greatest in the extremities, or rather almost entirely confined to the extremities, which draw their energy from the trunks. These seem to secrete the power, whilst the extremities expend it.

have been known to grow and live in the womb without any brain, receiving their vital energy from nerves alone; which proves, that a brain is by no means essential to the mere presence of vitality in an animal. On the other hand, we observe, that particular nerves may lose their energy, although the brain remains sound, as we see exemplified in paraplegia and partial palsy. At other times, we find both the brain and the nerve sound, but the connection subsisting betwixt them destroyed; in which case the nerve has only its own inherent energy, and derives no assistance from the brain, or parts above. This is daily seen in curvature of the spine.\* The doctrine may also be confirmed, by the case of a gentleman, who was paralytic from the head downward, but the heart and bowels continued their action. Here the spinal marrow only was diseased; and that portion of the brain which gave off the intercostal and sympathetic nerves, as well as those nerves themselves, was healthy. But it is most beautifully proved, by the well-known experiments of applying zinc and silver to the nerve of an amputated limb, by which we produce contractions of the muscles, and make the apparently dead member move upon the table. It has been long known, that if we tie a ligature upon the phrenic nerve of a dog, the motion of the diaphragm ceases; but if we stimulate the nerve below the compressed spot, by stripping it either upward or downward between our fingers, the contraction of the diaphragm, for a time, returns. By experiments upon the amphibious and reptile tribe, the doctrine is ascertained to be true beyond all dispute. It is well known, that a frog will live, for a couple of days, after his head is cut off; that he will jump about, and will even, if we may credit

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\* It is necessary, however, that this interruption take place gradually, in order to accustom the nerve to exert itself, if I may use the expression, independent of the brain: For, if we cut the nerve suddenly, we find, that the difference betwixt the energy inherent in the nerve, and that which it was wont to receive from the brain, is so great, that the parts cannot exist: The change is too great and too sudden.

the Abbe Spallanzani, return to the embraces of his mistress, if the decapitation has taken place during the payment of his addresses. It is also known, that if we divide the spinal marrow, the crural nerves being no longer assisted by the parts above, become weakened, having only their own energy, and the limb is palsied; but still there is energy sufficient to continue the circulation; and "the bones, if fractured, will unite." If we cut a frog across, we may make the legs move for hours, by applying the zinc and silver; or, if we suspend the lower half, by a wire, from the conductor of an electrical machine, we shall, by taking sparks from the legs, exhibit a very grotesque dance.

The tortoise will live, after decapitation, for many days; and, if we may credit naturalists, has been known to survive the extraction of the brain for half a year. The bodies of some serpents will move about, when irritated, even after being deprived of the head, skin, and heart. Kaau tells us of a cock, who run thirty feet after decapitation; and many other instances, of a similar nature, might, if necessary, be added.

From all these facts, it appears, that the nervous system is one great whole, having its energy universally diffused over it, and inherent in every part.

A doctrine similar to this has occurred to many, and, among the rest, to the ingenious Dr. Whyte; but he ascribes to the soul what is here attributed to the nervous energy; and, by this theory, is obliged to involve himself in metaphysical reasonings, concerning the extensibility of the soul, as taught by Gassendi, and others. According to him, when a muscle is removed from the body, and placed at ten yards distance from the body, the soul extends to it over all that part of space, and enables it to contract. When this muscle dies, then we must either suppose that part of the soul is lost, or that it retracts itself again within the body; which being

less than formerly, must have a greater proportion of soul; both of which suppositions would be ridiculous.\*

### *Of the Nervous Energy.*

Many have undertaken to ascertain the precise nature of the nervous energy, and the manner in which it is produced; but I apprehend, that no argument will be necessary to prove the vanity and absurdity of the attempt: It eludes all our researches; it does not come under the cognisance of our senses; and we might just as reasonably attempt to describe and comprehend a new sense, or detail the intimate nature of an unknown substance.

The ancients believed this energy to be of a gaseous nature, and maintained, that it was formed in the ventricles of the brain, from the air which we inspired.† This air, according to some, operated in part indirectly, through the medium of the lungs; but it was allowed by all, to act chiefly, by a direct ascent to the brain, through the cribriform lamella of the ethmoid bone. Those who were resolved to adopt implicitly whatever the ancients desired them to believe, were glad to forget the olfactory nerve, which filled these holes up completely, and chose rather to remember the pretended experiment, in which tobacco was found to tinge the brain, by being snuffed up the nose.‡ This supposition being, as they thought, proved, physiologists began to push the doctrines of the ancients still farther: They took up the conjecture where they ended, and attempted to explain the particular nature of the aëriform principle. Some called it a very thin air, impregnated with nitre; others, a mixture of air, sulphur, and saline matter: And, as every one is fond of

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\* Vide Whyte's Works, p. 202. "Of the Vital and other Involuntary Motions"

† Galen de Util. Respir. cap. 5.

‡ Fracassatus de Cerebro, p. 329.

making his own discoveries as important as possible, we find Mayow attributing this property to his nitro-aërial or oxygenous principle. This supposition was, in a manner, repeated by Barbieri, and has, of late, been revived by Dr. Girtanner, who can fill bottles, as well as nerves, with this principle of life and irritability.

Not less ridiculous than these conjectures, was that of Mistichelli, who imagined, that the nervous energy was produced by a kind of fermentation taking place, between what he called the sulphur of the blood, and a particular kind of air; or the conjecture of those who believed, that hartshorn was the true nervous spirit.\*

Those who attended less to chemistry, and more to anatomy, disbelieved these notions, and taught their own disciples, that the nervous spirit was not so very volatile; that it bore a more near resemblance to the other fluids of the human body, and consisted entirely of a finer portion of the lymph.†

The Cartesians, who loved wonders, called it pure flame, or a kind of neutral substance between flame and air;‡ whilst the Newtonians, forgetting the accuracy which mathematics might have taught them, imagined their æther to be the principle of life. The supposition which Sir Isaac Newton threw out, in the form of a query, was adopted by many, and, amongst others, by Dr. Mead, who observes, that “this fluid, (the nervous energy,) so far as we can discover by its effects, is a thin volatile liquor, of great force and elasticity, being indeed most probably a quantity of the universal elastic matter (æther,) incorporated with fine parts of the blood, separated in the brain, and lodged in the fibres of the nerves. This is

\* Cheyne in the *Phil. Princip. of Religion*.

† Berger, p. 269.

‡ Although they believed this, yet they were foolish enough to talk of valves in the nerves, as if this matter could be obstructed or regulated by valvular folds. Vide, *Descartes de Homine*.

the instrument of muscular motion and sensation, a great agent in secretions, and indeed in the whole business of the animal economy.”\*

Other physiologists rejected this conjecture, concerning the action of a suppositious principle, and referred life to the operation of causes with which they were better acquainted. Magnetism and electricity were too wonderful agents to be overlooked: The last was by many supposed to constitute the nervous energy, and even of late we find some supporting a similar doctrine.†

Partly, perhaps, from the absurdity of these notions, and partly from chimerical principles, the very existence of a nervous fluid was denied, and the agency of the soul or mind became more attended to. That the phenomena of life depended upon the rational soul, without the assistance of any other energy, was the opinion of some; whilst others allowed the existence of a peculiar power in the nerves, but maintained, that this was, to the utmost extent, under the controul of the soul, which presided, as an autocrator, with wisdom, over all the operations of the living body.

Having given up the doctrine of a nervous fluid, it became necessary to explain how the nerves performed their various offices, particularly those of motion and sensation, and how external stimuli acted on them. This they endeavoured

\* Mead's Works, 8vo. p. 14.

† See the experiments of Valli, Galvani, and others, on this subject. “The similarity of the texture of the brain to that of the pancreas, and some other glands of the body, has induced the inquirers into this subject to believe, that a fluid, perhaps much more subtle than the electric aura, is separated from the blood by that organ, for the purposes of motion and sensation. When we recollect that the electric fluid itself is actually accumulated and given out voluntarily by the torpedo and gymnotus electricus; that an electric shock will frequently stimulate into motion a paralytic limb; and, lastly, that it needs no perceptible tubes to convey it, this opinion seems not without probability; and the singular figure of the brain and nervous system seems well adapted to distribute it over every part of the body.”

to do, upon the mechanical supposition of tremors and oscillations, which were excited by the impressing cause, and propagated along the whole course of the nerve. Much time was spent in examining the fibres of the nerves, and their direction; nor is there almost any course or direction which was not attributed to them.\*

Another set of physiologists united the two theories, and admitted both the existence of a nervous fluid, and the action of tremors.†

Concerning the absurdity of all these opinions, I think it unnecessary to make any observation. The doctrines survived, for only a very little time, their inventors; and the more intelligent part of investigators soon came to confess their ignorance of the nature of this principle.

If the notions which the older physicians entertained concerning the nature of the nervous energy were erroneous, we are not to expect that their explanation of its operation, or their application of their knowledge to the cure of diseases, should be more perfect. Their systems were full of quick motions and ‡ slow motions of the nervous spirit, and tensions, and contractions, and relaxations of the nerves themselves, and fermentations, explosions, impulses, and pre-established harmonies. We may wonder how this could be suffered by men of sense, or how they could possibly explain diseases on

\* Some supposed that the nerve consisted of spiral fibres, which could shorten and elongate; others, that it had rugæ, which might be made greater or smaller; and that on this depended the action of the nerves. Whenever the nerve was tight, than the sensation was acute; and vice versa.

† This opinion has been in part revived by Dr. Darwin, who supposes that the vital spirit produces motions or contractions; and builds his theory on the different kinds of motion.

‡ Part of the nervous spirit was, in their opinion, exhaled into the cavities of the body, or, by insensible transpiration, from the body; the rest was returned from the nerves, by the veins, to the heart, and sent from thence to the brain. Others supposed, that it passed into glands, or was condensed into lymph, and thus returned to the head through the medium of the heart. See the Works of Regius, Segerus, Gavet, Lancisi, Targirus, &c.

these principles; but the wonder ceases, when we know that they founded their system of pathology more on the blood and imaginary humours, than on the nerves: their doctrines were either chemical or mechanical, and they knew nothing of the peculiar and varied action of the nervous system.

Concerning the true and precise nature of the nervous energy, nothing ever can be said; because it never can come under the cognizance of our senses; and even concerning its production and operations a very great deal is conjectural. We know, however, that there is such a principle, and that this principle, by the application of certain stimuli, exhibits certain actions or operations which are essential to life, and in which it consists. These actions, in the aggregate, may be called the natural and healthy action\* of the system; and the presence of this action is absolutely requisite for the continuance and support of the energy;† for, whenever the action becomes changed, either in degree or nature, weakness is the consequence; and this weakness is proportioned to the difference betwixt the diseased and natural action of the system.

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\* It is not easy to give such a definition of the *natural actions* as shall not be liable to be misunderstood. It does not consist of digestion, secretion, &c. considered as a group of separate and distinct functions, but in a peculiar indescribable condition, which exists in health, and of which these operations are effects, rather than parts: still, as the right performance of all these functions depends upon the natural and healthy action of the system, these, taken collectively, may give some idea of this action. Part of the natural action consists in the renewing or producing of the nervous energy, which is to be considered as a species of secretion.

† It may be said, in objection to the supposition that the renewal of the energy is an immediate and direct effect of the natural action, and flows necessarily from it, that, were this the case, an increase of the natural action should not produce weakness in the end. But this idea proceeds from not rightly understanding the natural action, which is not a distinct assemblage of functions, but a general and peculiar condition, of which these functions make a part; and, therefore, although an increase of a particular function, such as muscular motion, does expend more energy than is produced, and consequently weakens, yet a general increase of natural action, if it be not to such a degree as to change its nature, and thus impair it, does augment the quantity of energy, and produces strength; if it be changed, then it weakens.

The brain has, by almost every physiologist, been considered as the preparer and source of this energy ; and, even in the present day, is ranked amongst the secreting glands. That this energy exists in the brain and nerves, and that it exists in greater and less quantity, at different times, is undoubted. The embryo contains less energy than the child, and the child much less than the adult. He who is reduced, by abstinence and long sickness, has much less energy than the healthy and robust man. These facts require no proof; for the imbecility of the natural action of those people, and their inability to support disease, proves it beyond doubt.\* It is necessary, however, here to remark, what will be afterwards more fully explained, that we are not to confound an appearance or feeling of weakness with real and absolute diminution of energy;† because certain temporary morbid actions may take place, which, by their diminution of the natural action, for a time, give the appearance of weakness. This proceeds sometimes from a simple diminution or suspension of natural action ; at other times, from the energy

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\* It is likewise certain, that particular parts of the body have less energy than others, and, consequently, less action. A part is only capable of acting by means of its energy ; and the degree of the one must always correspond to that of the other. The capability of supporting disease is proportionate to the strength or degree of natural action ; hence children bear disease worse than adults, and weakened parts worse than those which are strong ; at the same time, we cannot expect to see the diseased action so great in them as in the strong, although it is such as to destroy them ; because the energy which is to support it is less. Still, although it be not considered as absolutely as strong or great, yet, relatively considered with regard to the power, it is greater.

† Whenever the natural action is lessened, weakness is felt ; and this is more observable, in proportion as the diminution is sudden. Emotions of the mind, and many other causes, by lessening suddenly the natural action of the system, produce syncope ; but, in a few minutes, the person is often as strong as ever. Here we cannot suppose a sudden loss and restoration of energy ; it was only the action which was affected ; but, had this action continued for any considerable time, then real loss of energy would have followed, upon the principles already laid down.

being employed in an action dissimilar to the healthy one. At the same time, if this action does continue for any considerable time, real diminution of energy will take place; because a certain action is necessary for the support of the energy; and, in health, this action always bears an exact proportion to the degree of energy. The action of the energy is often very suddenly lessened, in which case, weakness or syncope is the consequence; and often it is as suddenly restored, in which case our strength returns. Energy may be suddenly lessened, but it never can be suddenly restored.

This energy is not produced in consequence of the structure of the nerve, or by any power proper to the nerve, and necessarily connected with a medullary texture. If it depended on structure alone, man should live as long as his fabric remained unimpaired; and if it depended on any peculiar power of the nerves, distinct from the action of the energy itself, we must acknowledge a new principle; we must observe its operations, and ascertain what causes influence it, which will only multiply difficulties.

It may perhaps be supposed, that the energy remains almost always the same, and that its action or operation only changes; but, in this case, whenever any action ceased or decreased, the quantity of energy should accumulate, which is an absurd idea. Some suppose an accumulation of the living principle; but the idea is ridiculous; for energy can never exist without action. Action requires energy; it consumes the energy, which must be replaced. If this were not the case, we need only excite the action by stimuli, and life should go on. As long as the blood circulated, action and life should be kept up, even without food. Death indeed would at last take place, from want of materials to supply the body, considered mechanically; but still the man should live for a long time, and until he consisted of little else than bones, nerves, and vessels. Man might, upon this supposition, be rendered immortal.

*Of the Blood.*

For the support and production of the nervous energy, a certain substance, namely, arterial blood, is requisite. This fluid, by its circulation, not only acts as a natural stimulus to the nerve, exciting and supporting its action, and thus enabling the energy to subsist, but it also affords the materials from which the energy is drawn. It was formerly mentioned, that there is nothing which can be called truly dead; that a vital principle pervades every substance, and extends its influence over the whole universe. This principle, it was mentioned, exists, in different degrees of delicacy, in the different classes of nature, and exhibits a regular gradation of perfection, in the different individuals. Common matter possesses a peculiar kind of life: When this matter is taken into the vegetable, not only its organization, but also its life, is changed, and we observe a very different appearance, both in the mechanical and vital system; but, when the vegetable is destroyed, then it becomes again, both in its substance and life, the same with common matter. When the vegetable is taken into the animal system, we likewise find a change, both in life and texture. We have then a certain gradation, which remains uniform; the material part of the one class forms the material part of the other, and the vital principle of the one forms the vital influence of the other.\* This change uniformly begins in the fluids. In the vegetables, the sap, and in animals, the chyle, which forms the blood, is the first step towards the change of life. These substances consist of matter, having a life proper to itself, differing as much from the active principle of common matter, as it does from the pecu-

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\* It must here be observed, that there is a material distinction betwixt life and soul, or mind: They differ essentially in their nature and operations.

liar life of the individual, considered as an organized body, and a whole.

From the blood is formed the material part of the animal, and likewise its life, or nervous energy. Neither the material part of vegetables can be converted directly into animal substance, nor their vital principle into nervous energy: There must be intermediate steps, and these are the chyle and blood. Vegetables, when alive, differ from animals, in composition, in organization, and in the qualities of their life. When taken into the stomach, and in a state of digestion, they differ from animal substances, in the same circumstances; but, when the living power of the animal has begun to operate in the formation of chyle, the distinction no longer subsists, at least to the same extent. A new substance is formed, and from this another, which is the blood; and from this an organized substance results, possessed of a more intricate structure, and a higher species of life.\*

Besides this source of the living principle, arising from the conversion of food into blood, and the consequent change of the one kind of life into the other, the blood likewise derives vitality from the air, during respiration. It may be considered as a fact, that whenever matter becomes part of a vegetable or animal, its active principle likewise becomes changed or elevated into the specific life of the individual of which it becomes a part. Now, we know that, in the course of 24 hours, about 3640 cubic inches of oxygen† are combined

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\* Every part of the body dies, and is replaced. If even a small part be removed, it is reproduced, and the new matter possesses the properties of the old. The nerves themselves, if divided, will unite; and the uniting substance is, to all intents and purposes, nerve. See Dr. Haighton's Paper in the Phil. Trans. on the Reproduction of Nerves.

† It is computed by chemists, that, besides the portion of oxygen, which combines with the carbone and hydrogen, in respiration, 360 cubic inches of that air *disappear* in an hour. This oxygen changes its state in the blood; for I know of no experiment which proves, that it is found in a gaseous state in the blood. This opinion, of respiration being subservient to the production of vitality, is also adopted, in one respect, by Dr. Darwin, who supposes, that an æthereal fluid is

with the blood, and become a constituent part of it, which affords a very abundant supply of vitality. The constant action of the system requires a much more frequent renewal of life, than we can suppose to be yielded by the food, when converted into chyle and blood. We likewise find, that, in many diseases, no food, or almost none, is taken into the stomach, for weeks, although the action of the system be very great.\* Respiration is a constant and uniform source, from which the expenditure of energy can be, in some respect, supplied; because the active principle, in oxygen, is thus conveyed to the blood, during its combination with that fluid; but respiration alone, without food, is not adequate to the necessities of man, both because the life thus attained is not equivalent to the demand, and also because the materials of nourishment are withheld. The vitality yielded by the food is, if I may so speak, more permanent, and is united with the structure of the body, when the deposition of new matter is made by the blood. The vitality furnished by the air seems to be yielded to the nerves, during the course of circulation, for the immediate performance of the actions of the system.

As the elevation of life, or the conversion of the lower into the higher, begins in a fluid state, so also does its descent. The solid parts of animals are continually changing into a fluid or lymph, which is thrown out of the body,† as

yielded by the air to the blood, and secreted from it again by the brain. *Zoonomia*, Vol. I. p. 471.

\* The drink used during illness, may reasonably be supposed to assist in the production of vitality; but it cannot of itself yield enough. By being long boiled with a little farinaceous substance, water yields more nourishment, and more life, than either it or the farina would do separately and unboiled; but, in sickness, it is not employed in this form. See Count Rumford's Essays.

† This lymph is, along with the chyle, poured, by a common trunk, into the subclavian vein. It is then, after passing through the lungs, circulated along the body, and is, most probably, the substance from which the different excretions are formed: It is thus thrown out of the body, and begins to assume new states and conditions, and to answer other purposes, in the general and extensive operations of nature.

unfit again to become organized animal substance, until it has undergone new changes, and been converted either into vegetable matter, or animal substance of a lower degree. Even the nerves themselves terminate directly in a soft and fluid matter; and perhaps it is only when the nervous energy is leaving the body, that it is capable of action; at least, we find, that action is uniformly attended with an expenditure of energy; and the greater the action, the more speedy is the loss of energy: We likewise know, that it is only the extremities of nerves which act.

I have said, that for the production of this energy, and the support of its action, the presence of arterial blood is necessary. This is one of the natural stimuli to the system, and excites those operations of the nervous energy which are necessary for life, and which, in the aggregate, are called the natural action. This action is, in common language, called life,\* whilst the energy which produces it, being unseen, is overlooked. The continuance and presence of this action, is necessary for the preservation of the energy in the body, and for its production. Arterial blood, then, is of the utmost importance, as it not only affords the material from which life is drawn, but also is one great cause or exciter of that series of operations, which are necessary for the renewal of the energy, and its preservation in the system.

This fluid has, at all times, received particular attention from physicians, and its composition has been examined with more accuracy than perhaps was necessary for the practice of physic. But, as formerly the systems of pathology were founded almost entirely on the different states, real or supposed, of the blood, we cannot wonder at the attention which was paid to it. Notwithstanding the many observations which

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\* This expression came to be used, from observing, that whenever this action ceased, the body was dead. In the same way, we apply the word heat to the sensation or action which it produces, oftener than to the principle which causes it, which of itself is not hot.

were made upon this fluid, and the various opinions which have prevailed concerning it, it is only of late that it has been supposed to differ from common matter, or to possess any living principle.

Mr. Hunter, who was the first who taught that the blood was alive, founded his opinion, not upon general reasonings on the nature and extensive operations of a living principle, or upon the necessity of the thing, but upon the observation of certain particular phenomena, and especially on the coagulation of the blood. This living principle he supposes to be the same with that of the rest of the body, and that something similar to the brain is distributed through the blood,\* which he calls the diffused matter of life. This conjecture cannot be admitted; because, in the first place, it supposes, that life depends upon a particular substance or species of matter; and, in the second, we cannot see how, or by what power, this substance is to be formed in the blood. I have already mentioned my idea of life, and its gradation; and also, that the blood seems, in a perfect animal, to be the first step toward the conversion of common and vegetable matter into a substance possessed of animal life; but that this life differs as much from the peculiar life of the animal, as it does from that of the matter from which it is formed. Blood is to be consider-

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\* "I would consider, that something similar to the substance of the brain is diffused through the body, and even contained in the blood, and between this and the brain the communication is kept up by nerves." Hunter on the Blood and Inflammation, p. 89.—Are we then to consider that the brain is a mass of life, and that a similar matter is diffused over every part of the body, and floats in the blood; that the nerves are quite different in their nature from the brain, and consist of different materials, and are endowed with a different and distinct power or principle, acting merely as connecting lines betwixt the life of the brain and the life of the body, or literally as *chordæ internuntiaë*? Does life indispensably require, for its presence and existence, something similar to the substance of the brain? and does it exist wherever this medulla is to be found? Do we observe any thing like this in plants? Do we see it in muscles, in ligaments, in bones? or has it ever been detected in the blood? Vitality may exist in substances, with very different structures and organization; and I have already mentioned, that the living principle itself varies very much in different individuals and classes.

ed, in one respect, as extraneous to the body, operating and exciting to action as an extraneous body, and yet possessed of powers which show it to be endowed with a peculiar life. We are to consider it in two views; first, absolutely, as a living animal substance, having peculiar properties, and consisting of different parts, kept together by life, and separating, when dead or dying: Second, relatively, as the source of increase and nutrition, and as making a part of the animal body, acting upon it as a stimulus, and being itself acted upon by the vessels which contain it. This reciprocal action and reaction is absolutely necessary for the preservation of each; for, if either fail, both die. As long as the blood is alive and perfect, it produces the life of the animal, and supports its action; and, as long as the animal and its vessels are living and healthy, the blood is kept perfect and alive. When the animal becomes diseased, the life of the blood becomes also affected, and its peculiar quality is injured. The proper characteristic of blood, considered absolutely as a living substance, is its tendency to become solid, or coagulate. If its vitality be not previously injured, it uniformly becomes firm, and its parts separate, as soon as it is removed from the action of the vessels; and, whenever this coagulation takes place, it ceases to be blood; it dies. Mr. Hunter supposes, that this coagulation is to serve a useful purpose with regard to the body, and particularly, that it becomes the means of nourishment: But nourishment and increase depend upon a much nicer process; and coagulation never can, and never does, serve any useful purpose, otherwise than mechanically stopping a hemorrhage; in which case, it is precisely similar to any other dead body; and, whenever coagulation does take place, it becomes absolutely useless to the animal, in any other point of view, and can no more serve the purposes of blood, than the curd of milk can. Mr. Hunter, however, is of a very different opinion; for he believes, that the coagu-

lum is still alive, and possessed of the power of action within itself; that it can form vessels, unite itself to the surrounding parts, and assume actions and appearances according to the nature of the surrounding parts. "The moment it is at rest, (says he,) it begins to form itself into a solid, and changes into this or that particular kind of substance, according to the stimulus of the surrounding parts, which excite this coagulum into action, and make it form within itself, blood-vessels, nerves,"\* &c. If this were the case, an aneurism ought never to burst; because, when the blood coagulates, the old coat of the vessels ought to assimilate it into a new one. Every observation confirms the opinion, that, when the blood coagulates, it dies; but how or why it does coagulate, never can be ascertained, more than how or why other actions are performed, the utility of which we do not clearly discern. Arterial blood coagulates rapidly, and into a mass: Veinous blood coagulates slower; the serum separates freely, but the red globules are mixed with the lymph. In some diseases, it is still slower, and a buffy crust is formed from the separation of the globules. In others, it never takes place; the blood, from the action of the body, being almost deprived of its vitality, before it can come into a state of rest. 'This we see in the effects of great fatigue, lightning, poisons, bad fevers, &c.

The complexity of the vascular system appears, in every animal, to be proportioned to the perfection of the nervous system; and the purity of the blood uniformly corresponds to the delicacy of the living principle. It would be useless here to mention all the mechanical variations which take place in the heart and vessels of different animals: It will be sufficient to observe the particular conformation which affects the purity of the blood. In every animal, where the living principle is naturally of a low degree, (by which I mean, of a kind incapable of exhibiting the actions of an animal, in the perfect

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\* Hunter on the Blood, &c. p. 86.

manner in which they are performed in man,) the blood is impure.

In the frog, we find a heart, consisting of one auricle and one ventricle: The blood, being returned from the body by the veins, goes into the auricle, and from thence into the ventricle: This sends out a large trunk, which soon divides into two: These again, shortly after the first division, subdivide into other two branches: One of these branches, on each side, goes to the lungs, and the other turns down, to join with the one arising from the other side: These last uniting, form a large aorta: The branches, which are distributed on the lungs, or bladders of air, carry their blood thither, from which it is returned into the auricle. But I have already said, that all the veinous blood from the body was also returned to the auricle: There must, therefore, be in the heart a mixture of arterial blood from the lungs, and veinous blood from the body; and it is this impure blood which circulates in the arteries, and supplies the body.

In the turtle, we have distinctly two auricles and two ventricles, forming a double heart, similar, in this respect, to the heart of man; but, as these two ventricles communicate by a hole in their septum, they are to be, in reality, considered only as one cavity. From the right ventricle, or, more properly speaking, the right side of the joined ventricle, arise the aorta and pulmonary artery; the one supplying the body, the other running directly to the lungs, from which the blood is returned, by the pulmonary vein, into the left auricle; from this it is sent into the left ventricle, and thence, through the hole in its septum, into the right ventricle; so that, setting aside all this round-about course, we may say, that the blood is returned from the lungs into the right ventricle. The blood, again, which is sent out by the aorta, is returned, by the vena cava, into the right auricle, and from this into the right ventricle, where it meets with the blood from the lungs.

There is, then, a mixture of venous and arterial blood in the turtle, just as in the frog; and this mixture is sent again, in part, through the lungs, and the rest through the body.

In the crocodile, the same happens; only, the two ventricles have no septum, but form one bag, without any division.

The consequence of this construction, in these animals, is, that the blood, which is sent to the lungs, is never entirely venous, but partly venous and partly arterial, by which the supply of air will last longer, and the animal require to breathe less frequently. But, secondly, the effect of this construction, and the consequent impurity of the blood upon the system, is, that the life of the animal is of a less delicate nature, than that of those animals, where the blood is pure: Their action is not raised to such a degree, as in the higher classes; and all the operations of their system are of a lower nature. This, which is an imperfection in one sense, is, however, a degree of perfection, greater than we find in man, if we view life only with regard to its preservative powers; for those animals, whose life is of so low a kind, that it is not susceptible of quick actions, are a long time of being destroyed, by such causes as would instantaneously kill any of the higher classes: We may remove their brain, and thus materially injure that system, in which the specific life is resident; we may cut out the heart, and thus destroy the circulation; or, we may prevent the purification of the blood, by removing or cutting up the lungs; and yet the animal, under any or all of these causes, will continue to live for many hours, sometimes for months.

Where the life is of the highest kind, but its quantity naturally small, and the action required, at a particular time, is very little, we likewise find the blood impure. This we see to be the case in the foetus in utero, where the action required is very trifling, and where the heat produced\* (which gene-

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\* As the foetus is placed in a medium as warm as itself, very little heat is necessary to be produced, in order to keep it at its proper standard.

rally bears a proportion to the natural purity of the blood) is little.

In the child in utero, \**“the blood is received pure from the placenta by the umbilical vein, and is conveyed by it to the navel of the child. Here the vein enters, and passes into the liver, dividing in it into many branches, which ramify through the substance of that gland, whilst the continuation of the trunk runs forward, and terminates in one of the branches of the vena portæ. Thus, we find, that one portion of the pure blood of the umbilical vein is distributed to the liver, whilst the rest is sent directly to the right auricle of the heart; but, previously, it is mixed in its passage with the impure blood in the vena portæ and vena cava.*

*“There is, then, by this contrivance, a mixed blood in the right side of the heart, which is purer than the venous blood of the fœtus, but much less arterial than the blood of the arteries after birth; from which we may infer, that a very great change takes place in the system and constitution of the child after delivery. When the right ventricle contracts, the blood is not sent through the lungs, as it is after birth, but directly into the aorta, at its curvature, by a vessel running from the pulmonary artery into the aorta. By this construction, we see that very little blood should enter the left auricle; and, consequently, that the whole left side of the heart should be almost empty. But, to prevent this circumstance from happening, we find an opening or valve in the septum, betwixt the auricles of the heart, which permits the blood to flow from the right to the left side directly, and then the whole heart is equally filled. It is for preserving the heart in a state fit for acting after birth, that we have both a foramen ovale, and a ductus arteriosus. Either of these, individually, would have served the immediate purposes of the fœtal circulation: but,*

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\* Anatomy of the Gravid Uterus, p. 135. et seq.

by thus dividing the blood, both the pulmonary artery and the left side of the heart are kept of a proper size, and in a due state of action.\*

“ By the aorta, this semi-arterialized blood is distributed to the body ; but, instead of the whole blood in the descending aorta being conveyed to the viscera and inferior extremities, one half of it is sent directly to the placenta ; for the internal iliac arteries turn upward to the navel, through which they pass, and form the two umbilical arteries. The blood, therefore, which is returned to the placenta, is as pure as that which circulates in the arteries of the child, and, therefore, requires a less change to convert it into the state in which we find it in the umbilical vein.”

If, by any means, the blood be not sufficiently purified, or, in other words, if it do not possess, to a sufficient degree, the properties of blood, we find, that the powers of life are small, the actions of the whole system are imperfectly carried on, and the individual sinks prematurely into the grave. When, as has been already mentioned, the adult heart remains in the same state with that of the fœtus ; when the pulmonary artery is deficient ; when the two ventricles communicate, and the aorta arises from each ; or, when the lungs themselves are injured, or ill formed, then the most distressing symptoms

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\* “ The use of the sides of the heart is, in one respect, the reverse in the fœtus of what it is after birth. In the fœtus, the right side receives the purest blood, whilst the left receives it after birth. In the adult, the blood which is in a state fit for circulation, is collected in the left side ; and therefore, the great artery of the body arises from that side. On this account, there must of necessity be a communication betwixt the aorta and the right side of the fœtus, which performs the functions of the left side of the adult heart. If this communication does not close up after birth, then the contents of the right side continue still to be sent into the aorta. But as the quality of the blood of the right side is now materially different, very different consequences take place from those which resulted from the same mechanism before birth. The whole blood of the body is now rendered impure, the purposes of circulation are only half performed, and the unfortunate individual drags on a most miserable existence, until he sinks prematurely into the grave. One man, from whom I procured a preparation of this kind of heart, lived this unhappy life for forty years.”

take place ; distressing, on account of the general condition of the system, but still more painful, from the local affection produced in the chest. The effect, however, of the want of arterial blood, is more immediately seen in cases of suspended respiration. In hanging or drowning, death is produced by the want of arterial blood ; and the universal method of cure has been, to attempt the restoration of respiration, although this has not always been done upon the true principle. By inflating the lungs, respiration is often restored, but it also very frequently fails ; because the mere blowing in of air neither infallibly excites the action of the lungs, nor does it, as some suppose, change the blood ; for this change is an action dependent on life, and cannot be imitated by the chemist more than digestion. The alteration of the blood does not depend, as many imagine, merely on the presence of air ; a peculiar action of the lungs, or their vessels, also is necessary. Food and air are to be considered in the same light, both only supplying materials for the system to act on, and not themselves acting independently of the animal. When inflating the lungs does not very speedily restore their action, and consequently the change of the blood, we ought to transfuse arterial blood from another animal, and thus reduce the person to the state of the fœtus, whose blood is purified by lungs out of the body.

### *Of the Pulse.*

I have said, that it is the pure or arterial blood alone, which is valuable to the system, considered as a whole, and which preserves the life, and yields the nourishment of the body. This is sent out from the heart, as a source to all the different parts of the body, by regular and continued contractions of the heart and arteries, and is returned by the gentler action of the veins. These contractions depend upon the

living principle, connected with the muscular coats, and must be influenced, in their frequency and force, by the state or action of the energy of the system in general, with which they sympathize in a very great degree.\*

The nervous and vascular system mutually react on each other ; and, therefore, we find it of use, in disease, to attend to the state of the vessels ; because, as the changes induced on them are some of them of a mechanical nature, we can more easily detect them than the nicer alterations in the action of the nervous system, were we to confine our attention to that system alone. The state of the pulse, then, is of importance to be attended to, and will lead us to ascertain the presence, and sometimes the nature, of many morbid actions and deviations.

There are several parts of the vascular system, by the action of which, individually, the pulse may be affected. The heart, and great artery, the smaller arteries, and the veins, all influence the pulse ; and it is easy to ascertain to what degree any of these parts operate.

The heart is the origin of motion, and gives to the pulse its particular feeling, with respect to motion, such as regularity, frequency, slowness, intermission, fluttering, &c.†

\* Many disputes have taken place concerning the action of the heart ; some referring it to the influence of the nerves, and others of a *vis insita*. If I have been right in my position, that the energy is universally diffused and inherent in every part of the nervous system, I apprehend that the arguments in support of the existence of a *vis insita* will not have much weight. This controversy is to be found stated in Haller's *Elementa Physiologiæ*, tome I.

Praxagorus referred it to a *vis pulsifica*, or peculiar pulsatory power ; others to an innate heat, which rarified the blood, whilst the air cooled it, and that this alternate operation produced pulsation ; others ascribed it to fermentation.

† These particular states of the pulse always depend upon the heart. In all increased actions of the living principle, the heart is affected, and contracts oftener. In all instances where the heart is affected locally, we have irregular contractions or intermissions, as we find to be the case in spasmodic affections of the heart, or its great vessels, malconformation of the heart, diseases of the aorta, or pulmonary system, &c.

The arteries act partly by their elasticity, and partly by their muscular power: The muscular power is greatest in the smaller arteries, and the elasticity in the larger; the one diminishing as the other increases: The aorta is the most elastic, and the least muscular; and, therefore, its action depends chiefly upon that of the heart, to which it is to be considered as an appendage: The action of the smaller arteries, again, depends much upon their own contracting power; but not entirely on this; for the elasticity of their coats likewise operates, unless the artery be very small, in which case it has no elasticity.

There are, then, in the arteries of the arm, for instance, two causes, operating in producing and influencing the pulse: First, the elasticity of the artery; and this cause is affected by the heart: Second, the muscular contraction of their coats; and this is affected only by their own condition, independently of the force of the heart. As the heart, then, gives to the pulse its particular feeling, with respect to motion, so does the contraction of the artery give to it the particular feeling, with regard to size and quickness of contraction, producing the conditions of fulness, smallness, hardness, softness, &c.

The veins, like the arteries, act partly by elasticity, and partly by muscular contraction; but the order is reversed in them; for the greatest veins seem to have most muscular action, whilst the small ones have none, or almost none.

The auricles of the heart belong to the venous system, and the ventricles to the arterial. The action of these two parts of the heart is alternate; and, therefore, the action of the arteries and the veins is likewise alternate, the one dilating, whilst the other contracts. In health, the action of the veins and arteries correspond exactly, and a regular and equal circulation of the blood is kept up; but, in disease, they often disagree, at least in the commencement of the diseased

action; for the veins are less irritable than the arteries, and are longer of being affected.\*

There are, then, three causes which affect the pulse; and, by attending to the state of the vascular system, we may ascertain the proportion in which these operate, in any particular case: First, the heart and aorta; second, the branches of the aorta, or arteries of the body; third, the venous system.

A healthy pulse contracts slowly and regularly, and the pulsations do not exceed about seventy in the minute: We feel the artery rising softly against the finger, with a moderate degree of fulness. In disease, the pulse becomes either slower, or more frequent, full, small, hard, weak, or strong.†

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\* External heat, and many other agents, induce a fulness of the veins for a time, until the equilibrium be restored; and, in many instances, we feel the accumulation of blood in the larger and internal veins. This state is often attended with a small quick pulse, marking a contracted state of the arterial system. The skin is pale, and the body often appears to be shrunk, as we see in the commencement of febrile diseases.

† Practical writers have admitted of an almost infinite variety of pulses, which are now believed to be, in a great degree, imaginary, and therefore are overlooked. As a specimen of this, I shall only subjoin an extract from the Compend. Med. of De Gorter, who, although he enumerates many distinctions, which we now set aside, yet has not given the third part of what many others mention.

“ Si cor singulis ictibus majori vi contrahitur, sanguis celeriori impetu in latera arteriarum ruens eas dilatat solito magis, quæ dilatatio digitis percepta, si non multo major solito, *robustus fortisque pulsus* dicitur et *validus*; notans cordis vigorem, et copiam sanguinis singulis ictibus ejecti: in morbis bonum præsagium, nisi ob cerebrum compressum ut in apoplecticis, et contusione cranii, animi deliquie scorbuticorum, aut ob compressionem notabilem rami arteriosi hujusmodi fiat pulsus.

“ *Vehemens* autem pulsus, digitos veluti removens ab arteria, nec quiescens fortiori digitorum compressione, ut in sanis fieri solet, fortissimam cordis contractionem, quæ spiritus consumuntur, et motum humorum velocissimum solida destruentem indicat. Omnia ergo mala, quæ ex his fieri solent, præagitur, et videri possunt in aucta circulatione. In morbis acutis inflammatoriis et erysipelatosi observatur.

“ Quando arteria instar chordæ tensæ dura, contra digitos attollitur, *Durus* dicitur pulsus, fortem indicat arteriæ impletionem, cum impedito transitu sanguinis per arteriæ extrema, membranarum internarum, ut pleuræ, et meningum, inflammationi comes. Si arteriæ simul constringuntur magis, est durus et parvus:

These conditions it is impossible here fully to describe. I shall, however, keeping the general observations already

alias durus et magnus, qui melior: præsagia ex inflammatione, febreque acuta ardente petenda.

“ Si, *Imo*, cordis constrictio imbecillis sit. Ut in cerebri compressione phreniticorum, lethargicorum, delirantium, tetanicorum, soporosorum, vel ex defectu spirituum in periurinis, morbis vehementissimis vires corporis superantibus. *2do*, Si interceptiatur fluxus sanguinis ad cor, ut in peripneumonia, tuberculo pulmonum, pleuritide validissima, sufficientem pulmonis explicatione inhibente; vel per hepar eo sc. obstructo, aut inflammato, vel nimia quantitate sanguinis evacuada extra corpus, vel collecta in cavis, aut vasis dilatatis, ut in hydropicis, empyricis: humoris nimia evacuatione, a partu, ruptioneque vasorum interna. *3tio*, Laxatus tonus solidorum in scorbuticis, hystericis, stomachi debilitate laborantibus, rachitide, in parte paralytica, leucophlegmaticis, doloribus flatulentis. *4to*, Inflammatio et febris ardens, in gangrænam vel sphacelum abiens. *5to*, In principio invasionis febrium, pulsus minori vi digitos applicatos percutit et attollit, et a compressione eorum paulo majori omnino suffocari potest; pulsus hic debilis dicitur a Medicis. Quandoque talis videtur fieri, si multa pinguedine vel tumore aquoso arteria tecta sit. Talis pulsus, quia arteria minus attollitur, *humilis*; minus percipi potest, *obscurus*; arteriam minus dilatatur, *exilis*, *gracilis*, *exiguus*, *parvus*; minus implet, *vacuus*; tandem in summo gradu *deficiens* et *deletus* dicitur, quorum omnium cognitio et prædictio ex his clara.

“ Alterum quod in singulis pulsibus animadvertitur, est celeritas et tarditas. Celeritas pulsum, quamvis a multis Celeritas cum frequentia confundatur, omnino distinguenda videtur, intelligimus enim per celeritatem, si ab initio dilatationis usque ad integram, et ab ea iterum ad quietem, minori temporis spatio peragitur, quam in sanis pulsibus fieri debet; quod exploratione digitorum facile percipiendum. Si vires deficiunt cum humorum defectu, atque quodam stimulo irritante, cor minimo momento, veluti ictitans, se contrahens, citissime dilatatur arteriam brevi tempore subsidentem. Ut plurimum in cholera, febre et temperamento bilioso, atque febre erysipelatosâ observatur. Dicitur etiam velox et ictitans quandoque.

“ Huic oppositus est, qui vocatur *tardus* et *lentus*, in visciditate humorum frequens observatur, ut in cachecticis, scorbuticis, leucophlegmaticis, quod ob sanguinis lentorem longius tempus insinatur, antequam integre arteria impleri potest, et cor evacuari.

“ Cordis actio in pluribus pulsibus aut frequentius, aut rarius exercetur. Quæ pulsationes inter unumquemque ictum brevius spatium temporis relinquunt, seu si eodem temporis spatio sæpius pulsant, pulsus dicitur frequens, a quibusdam celeris et velox dictus, sed perperam, indicat cordis frequentiores contractionem. Quod fit, *Imo*, ab irritatione phlogistica, ut in pleuritide, phrenitide, et membranarum inflammatione, quando et *frequens* et *durus*. *2do*, A materia acri biliosa, ut in febribus biliosis et erysipelatosi et *frequens* et *celer*. *3tio*, Defectu virium, ut in principio invasionis febrium, et circa statum, quando pessimus, phthisicis, periurinis, et similibus et *frequens* et *debilis*; si vero, *4to*, vires adaugeantur, ut ex usu

made in remembrance, make one or two remarks upon some particular states of the pulse.

Chalybis in chlorosi, singulis ictibus corde majorem copiam sanguinis ejiciente, pulsus fit *frequentior et major*.

“ Huic contrarius est, qui longiori intervallo vibrat, *rarus* dictus, a multis etiam lentus et tardus, quamvis talis ad præcedens genus potius pertineat. Blandum indicat humorem, hoc si ex humorum optabili indole provenit. vasisque apertis, magnitudine compensatur parvitas. Verum si ob visciditatem, cerebrum aut cerebellum obsessum tenentem, ut in pituitosis, leucophlegmaticis, catarrho suffocativo, syncope, et sopore, atque catalepsi laborantibus, fiat *rarus* et parvus aut debilis, summum periculum imminet, totum cerebellum obstructum iri.

“ Præter cuncta hæc pulsuum genera, qui æquales dicuntur, aliud est quod inæquales continet, *Imo*, in unoquoque ictu, et *2do*, in multis simul. Omnes hi pulsus nunquam quidquam boni indicant, non semper tamen mortis indicium: quibusdam enim satis familiares, in pulmonum morbis et scorbuto frequentes, et in quibus post mortem in corde polypus fuit inventus, aut pericardium cordi adnatum.

“ Pulsus singulis ictibus inæqualis, tribus ad minimum digitis dignoscendus, et qui cum aliqua duritie percipitur, *serratus* a Medicis dicitur. Indicat magnam cordis constrictionem, et inæqualem et variis in partibus arteriæ resistantiam. Idem imo pejora, ut pulsus durus præsagit.

“ Si satis magna sanguinis quantitas e corde pulsa arteriam non nimis resistentem undæ ad instar successive attollat, *undosus* vocatur: talis observatur in humorum abundantia, morbisque acutis et inflammatoriis, si crisis per sudorem natura moliatur, et quando in suppurationem abeat; in morbis autem Chronicis materiam alicubi hærentem in sanguinem receptam esse indicat.

“ Si cor minori vigore contrahitur, et singulis ictibus inæqualiter, minor quantitas e corde in arterias mittitur, qua arteria successive attollitur, ac si vermis sub digitis serperet, *vermicularis* pulsus dicitur.

“ Qui minorem adhuc vim cordis, et quantitatem sanguinis indicat, simili modo *formicans* appellatur.

“ Sed vero qui versus cor magis: et versus extrema minus dilatatur, quod cor non valeat, vel deficiat tantus liquor, ut tota arteria impleatur, *μύσχος*, ex similitudine caudæ muris a veteribus dicitur. Qui omnes in omnibus morbis periculosi sunt habendi pulsus.

“ Qui pulsus plusquam semel videntur attolli, et digitos ferire, *Dicroti* vocantur si simul debiles; verum si magis robustus, *Caprizans* appellatur, raro nisi in perinfirmis observatur, et agone mortis.

“ Huic quoque referendus *vacillans et tremens*, inæqualem et inordinatam artetriarum impletionem indicans, ex denominatione facile definiendus; vires vitæ fragiles et caducas indicat.

“ Inæqualium alterum genus duas continet species, *Imo*, *Intermittentem*, qui una alterave vice intercalatur seu deficit; in membranarum inflammatione gangrænam indicat, in acutis pessimus, in pueris vero dormientibus, plethoricis, senibus, præsertim mulierculis familiaris, et quibus cor pericardio accretum est.

“ *2do*, *Muscor*, qui singulis ictibus minor sentitur, ut in moribundis, quem iterum ulterius sine necessitate in decurtatos, reciprocos, et recurrentes distinguunt.

In all cases where the pulse becomes suddenly small, we may infer, that the proper balance no longer exists betwixt the venous and arterial system, but that the one is acting more than the other. We are not to infer from this state of the pulse, any thing with regard to the quantity of blood in the system; nor are we to suppose, that the blood necessarily circulates so fast through the lungs, as we would at first suppose; because, if there be an accumulation in the venous system, the same quantity will not pass through the lungs, at each contraction of the heart, as passed in health; and, therefore, more will not necessarily pass in a given time.

We are not always, from a small pulse, to infer, that the person is very weak, and requires cordials. On the contrary, whenever this state of the pulse is conjoined with a hardness, we may pursue a contrary plan, and detract blood; because the smallness and hardness of the pulse depends upon the complete contraction of the coats, and marks an action very greatly increased, and which must soon kill, if it be not checked. By opening a vein, we render the pulse slower, softer, and fuller, as we see in abdominal inflammation. Whenever there is an increased contractile power, producing hard-

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“ *Mollis fit pulsus, 1mo, si sufficienter non impleatur, defectu sanguinis, ut in peripneumonia, aliisque pulmonum morbis, atque hepatitide, qui tunc semper malus. 2do, Arteria nimis laxata, ut in scorbuto, leucophlegmatia, quando malus. 3tio, Minori influxu spirituum, ut in quiete corporis et somno, bonum indicat; sed in sopore, cerebri oppressionem. 4to, Sedato impetu spirituum in âbras motrices, cum corporis viribus auctis, et pulsus plenitudine, bonus in febribus.*

“ *Quantitas humorum in corpore contenta, et singulis ictibus e corde in arteriam ejecta, pulsum magnum, plenum, altum, latum, manifestum exhibet, et palpitationem. Qui boni, nisi fiant a nimia copia humorum, vel impedito transfluxu spirituum per cerebrum, ut in apoplexia, lethargo, phrenitide: vel ab obstructione rami notabilis arteriæ.*

“ *Sed singulis cordis ictibus minor quantitas in arterias derivata, pulsum parvum, vacuum, gracilem, obscurum, debilem, et etiam deficientem, facit; hoc si fiat defectu virium, ut in sphacelo, catarrho suffocativo, syncope, infirmitate, defectu sanguinis, valde malum: sed in obesitate, arteria multa pinguedine tecta, nil mali indicat.*”

ness, we may infer the existence of an action, in some part of the system, of an inflammatory nature, and will often be led to bleed, from this mark alone, when, from other circumstances, we would deem venesection improper.

In general, the pulse is smaller and harder in inflammation, in proportion as the system is affected; and hence we may, from its smallness, judge of the danger. In inflammation of the lungs, we have seldom, except in robust and plethoric people, a full pulse; at least, if the inflammation be very acute. In inflammation of the brain, the pulse is likewise hard, and seldom full; though the state of the pulse is not so often uniform in phrenitis; for great variations take place in this disease. In gastritis, the pulse is very small, and quick. The same is the case in inflammation of the small intestines; but it is rather fuller, when the great intestines alone are affected, and inflammation in them is not so dangerous. In cuticular inflammation, the pulse is fuller, but, of consequence, proportionally slower.

If we are not to be misled by a small, neither are we to be deceived by a full pulse; for this is often felt, even very near dissolution.\* In these cases, the artery is contracting very feebly, and is approaching to the nature of a vein. In dangerous apoplexies, the pulse is likewise often full, from the diminished power of the artery.

When the pulse is very weak, and very slow, we may infer, that the general action of the system is much diminished, and that syncope, or death, is at hand; for, immediately before death, we find a considerable interval betwixt the feeble contractions of the heart.

A slow pulse, conjoined with local pains, shows, that no in-

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\* In acute diseases, it is a very bad sign to find the pulse full, and the beat *very* frequent; for this marks, that the artery is unable fully to contract: We feel a vibration, rather than a contraction.

flammation is present, but that the sensation proceeds from a different cause, often a convulsive action of the part.

The state of the stomach, and abdominal viscera, influences the circulation greatly, producing, very frequently, a remarkable slowness of the pulse.

Deviations, in the function of circulation, are not to be considered as diseases in themselves, unless they depend upon some local affection of the organs of circulation ; and, therefore, we are not always to direct our remedies to the removal of these alterations alone : On the contrary, we more frequently attend to them, as marks, by which we may know what kind of action is going on. If, however, the diseased action be very much connected with the circulation, (as inflammation,) we attempt the cure by remedies directed to the vascular system, the state of which is one chief and dangerous symptom of the disease.

We have several methods of affecting the vascular system ; such as, cold, bleeding, sweating, stimulants, &c. ; and these are to be employed with two views : First, to restore the balance between the venous and arterial system, when this is destroyed ; and, for this purpose, sweating is the best remedy which we can employ : Second, to obviate some particular conditions ; such as, weakness, hardness, frequency, &c. ; and, for this purpose, we must apply the appropriate remedies ; such as, cordials, bleeding, &c. ; or, if possible, remove the cause.

### *Of the Equilibrium of Action, and Sympathy.*

Having proceeded thus far in the account of the living principle, and having mentioned, that it is diffused, in an equable degree, over the whole body,\* I may next observe, that,

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\* Although I maintain, that the vital energy is diffused, in an equable manner, over the whole body ; that is, each part having as much, in proportion to its ne-

in a state of health, the action of each part is proportioned to that of the rest, the whole acting equally. All the body is sympathetically connected together, and dependent, the one part upon the rest, constituting a general sympathy : But sometimes we find particular parts more intimately dependent upon each other, than upon the rest of the body, constituting a particular sympathy. Action cannot be greatly increased, in any one organ, without being diminished in some other ; but certain parts are more apt to be affected, by the derangement of particular organs, than others ; and it was the observance of this fact, which gave foundation to the old and well-known doctrine of sympathy,\* which was said to proceed, “*tum ob communionem et similitudinem generis, tum ob viciniam.*”†

It may be thought, that this position, of action being diminished in one organ, by its increase, either in the rest, or in some other part, is contradicted, by the existence of general diseases, or actions, affecting the whole system : But, in them, we find, in the first place, that there is always some part more affected than the rest. This local affection is, sometimes, the first symptom, and affects the constitution, in a secondary way, either by the irritation which

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cessities, as another ; yet I do not mean to say, that each part possesses absolutely the same quantity : The reverse is the case ; but each part is, in health, as perfectly supplied with it as the rest, considered with regard to its own functions and demand.

\* Many ridiculous explanations were given, of the consent of one part with another, such as, similarity of intimate structure, anastomosis of blood-vessels, connexion of nerves, &c. The theory which Hippocrates had of sympathy, is to be found in his book, *De Locis in Homine* : “*Corpus porro ipsum sibiipsi idem ac simile est, et ex iisdem compositum est. Similiter autem habet et parvas et magnas partes, itemque infernas ac supernas. Et, si quis minimam corporis partem acceptam male afficere velit, totum corpus affectionem sentiet, qualiscunque tandem ea fuerit ; propterea quicquid tandem minima pars pertulerit, a gentilitatem refert ac transfert, unaquæque ad suam, sive bonum sive malum id fuerit ; et propterea, corpus et dolet et lætatur cum minima gente, quia in minima omnes in-sunt partes, et hæc ad gentiles sibiipsis singula transferunt, et omnia denunciant.*”

† Laurentii Opera, p. 323.

it produces, or by an extension of the specific action. At other times, the local affection is coeval with the general disease, and forms a part of the direct effect of the exciting cause which produced the derangement. In the first case, the general disease is called sympathetic; in the second, idiopathic. We observe, in the second place, that, as there is some part which is always more affected than the rest, so also is there some organ which has its action, in consequence of this, diminished lower than that of the rest of the system, and, most commonly, lower than its natural standard. From the extensive sympathy of the stomach, with almost every part of the body, we find, that this most frequently suffers, and has its action diminished, in every disease, whether general or local, provided that the diseased action arises to any considerable degree. There are also other organs, which may, in like manner, suffer, from their association or connexion with others which become diseased, as will be immediately explained. Thus, for instance, we see, in the general disease called puerperal fever, that the action of the breasts is diminished, by the increased inflammatory action of the uterus.

In consequence of this balance of action,\* or general connexion of the system, a sudden pain, consequent to violent action of any particular part, will so weaken the rest, as to produce fainting, and, occasionally, death. But this dependence appears more evidently, in what may be called the smaller systems of the body, or those parts which seem to be

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\* The theory of a balance, of any kind, existing in the system, was first, I believe, decidedly pointed out by the late Dr. Irvine, whose chemical knowledge has deservedly raised his name high among the philosophers of Europe: But he only imagined, that a balance of sensibility or sensation exists in the body, which is a doctrine very different from the present, which supposes a balance of action. The ancient and common doctrine of sympathy, was very different from this, which I have attempted to establish; because it was believed, that the part sympathizing became affected with a disease, similar, or nearly similar, to that of the part originally injured.

more intimately connected with each other, than they are with the general system. Of this kind is the connexion of the breasts with the uterus of the female ; of the urethra with the testicles of the male ; of the stomach with the liver ; of the intestines with the stomach, and of this again with the brain ; of the one extremity of the bone with the other ; of the body of the muscle with its insertion ; of the skin with the parts below it.

Of these smaller systems, or circles, I shall treat regularly ; but, first, it may be proper to observe, that these are not only intimately connected with themselves, but also with the general system, an universal sympathy being thus established.

That there is a very intimate connexion between the breasts and uterus, has been long known, but it has not been very satisfactorily explained. Fallopius, and all the older authors, declare plainly, that the sympathy is produced by an anastomosis of vessels ; Bartholin adding, that the child being born, the blood no longer goes to the uterus, but is directed to the breasts, and changed into milk. But none of all those who talk of this derivation assign any reasonable cause which may produce it.

In pregnancy, and at the menstrual periods, the uterus is active ; but, when the child is delivered, the action of the uterus subsides, whilst the breasts, in their turn, become active, and secrete milk. If, at this time, we should again produce action in the uterus, we diminish that of the breasts, and destroy the secretion of milk, as is well illustrated by the case of inflammation of the uterus, which is incident to lying-in women.\* When the uterus, at the cessation of the menses, ceases to be active, or to secrete, we often find, that

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\* In puerperal fever, when the uterus becomes inflamed, the secretion of milk disappears, until the action of the uterus ceases. See the *Anatomy of the Gravid Uterus*, p. 73.

the breasts have an action excited in them, becoming slowly inflamed, and assuming a cancerous disposition. The uterus and breasts seem to be a set of glands, balancing each other, in the system, one only being naturally active, or secreting properly, at a time; and, accordingly, we seldom, if ever, find, that, when the uterus yields the menstrual discharge, the milk is secreted in perfection, during the continuance of that discharge; nor do we ever find them both inflamed at the same time.

The uterus has not only this connexion with the breasts, but it has also a very particular sympathy with the stomach, which again sympathises with the brain; and thus we see how a disorder of the uterus may induce an extensive series of affections, each dependent on the other.\*

The uterus has been known, ever since the foundation of physic, to produce very extensive disease in the nervous system; and it is amusing to hear how this was explained. The disease called "Suffocation of the Uterus," with many other hysterical ailments, were attributed to the swelling or choaking up of the uterus, by winds and vapours generated from the retention of the menses, or by the corruption of the semen, and putrefaction of the bad humours, which came there to be discharged; for this organ was considered by many as a common cloaca.† These "ventosities" being once gene-

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\* When the uterus has its action increased, at the menstrual period, the stomach is often much affected, and, along with it, the brain, and whole nervous system, producing hysteria. There is, at this time, every symptom of weakened stomach; such as, vomiting, belching, and, not unfrequently, spasmodic contractions. This state of the stomach will, in its turn, affect the brain, in the same way as it does after a debauch, or in violent dyspepsia; that is to say, it will produce head-ach or dizziness. This affection of the head is not the immediate consequence of the action of the uterus, but depends upon the disease of the stomach, induced by the uterus. Thus we see that organs may come to suffer, by the derangement of a particular part, although they do not directly sympathise with that part. A recollection of this may be of use in investigating the nature of some complicated diseases.

† "Cette partie est comme un cloaque ou sont envoyez tous les excrements du corps." *Ambrose Pare.*

rated, it was believed, that they mounted up to the stomach, the liver, and, at last, to the brain. The cure consisted in expelling these ; and one of the remedies which was employed for this purpose, was warm aromatic fumes, conveyed, by tubes, to the os uteri ; for there was no safety, they imagined, until this vile stuff was discharged ; this “ occult odour,” as Van Helmont calls it.

The organs of generation in the male, form likewise a little system, in which all the parts exhibit this sympathy with each other. They likewise give us a very good instance of the association of action, or sympathy, in the common acceptation of that word.

Sympathy has been divided into the contiguous, where parts become affected from vicinity, and the remote, where a distant part becomes affected. It will be more conformable to the present doctrine, which I apprehend to be true, to divide it into, first, the *sympathy of equilibrium*, in which one part is weakened, by the increased action of another ; and, second the *sympathy of association*, in which two parts act together, at the same time.

The sympathy of association of distant parts is produced suddenly, and for a short time : The sympathy of equilibrium is produced more slowly, and continues to operate for a much longer time.

It is curious enough, that most, or, at least, many of those organs, which seem to be connected by the sympathy of equilibrium, exhibit likewise more or less of the sympathy of association, when under the circumstances in which this can take place.

The sympathy of association may be divided into the interrupted, or the *sympathia consociationis interrupta*, in which distant parts are affected, whilst sound parts intervene betwixt them ; and the spreading, or the *sympathia consociationis serpens*, in which the action spreads inch by inch with

more or less rapidly. The interrupted sympathy generally is induced quickly, and, in many cases, does not last long; the spreading takes place more gradually, and is, in every instance, of considerable duration. It may also come to affect parts which were formerly influenced by the interrupted sympathy, and may overcome the natural tendency of particular parts to exhibit the sympathy of equilibrium. The interrupted sympathy is sometimes the forerunner of a general action, the brain or stomach sympathizing before any other part of the system.

The sympathy of equilibrium is seen in the effects of inflammation of the end of the urethra, on the testicle, which often diminishes its action, and produces a very disagreeable sensation of dulness; or, if this inflammation be suddenly diminished, the action of the testicle is as suddenly increased, and swelling takes place. The same is seen in the connexion of the urethra with the bladder and prostate gland, as will be more fully mentioned in the dissertation on gonorrhœa. These parts, likewise, affect the stomach greatly, increased action in them weakening that organ much.\* This is seen in the effects of swelled testicle, on excessive venery, or inflamed bladder, or irritation of the bladder, from a stone; all which weaken the stomach, and produce dyspepsia. The same remark applies to the kidney; vomiting and flatulence being produced by nephritis.

The sympathy of association, or an instance of sympathy, in the common acceptation of the word, is likewise seen in the connexion betwixt the glans and testicles, in coition; but, for this purpose, the action in the glans must be sudden, and of short duration; for, if continued long, weakness of the

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\* The effects of excessive venery, in producing dyspepsia, and, consequently, gout, is very well known. Unless this cause be removed, it is impossible for patients ever to recover from diseases of the stomach. Lord Chesterfield mentions, that when he consulted Boerhave, that celebrated physician added, by way of a note to his prescription, "*Venus rarius colatur.*" Letter cxxx.

testicles, or diminished action, is induced.\* In those parts which exhibit this natural association of action, if the action of one part be suddenly, and for a short time, increased, the action of the sympathising part will likewise be increased, as we see, in the instance already given, of coition, and likewise in paroxysms of the stone, in which the glans penis, after making water, becomes very painful: But, if the action be more slowly induced, and continued for a long time, then this association is set aside, by the stronger and more general principle of the equilibrium of action, and the sympathizing part is weakened. Hence, violent inflammation of the end of the urethra, produces a weakness and irritability of the bladder, dulness of the testicles, &c.

There is also an evident sympathy of equilibrium betwixt the stomach and lower tract of intestines, which two portions may be said, in general, to balance each other, in the abdomen. When the action of the intestines is increased, in diarrhœa, the stomach is often weakened, and the patient tormented with nausea. This will be cured, not so easily by medicines taken into the stomach, as by anodyne clysters, which will abate the action of the intestines. When the intestines are inflamed, as in strangulated hernia, vomiting is a never-failing attendant: When, again, the stomach is inflamed, the intestines are affected, and obstinate costiveness takes place.† Even in hysterical affections of the stomach, the intestines are often deranged. Injections of cold water frequently relieve these affections of the stomach, by their action on the intestines.

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\* It is on this principle, that, if emission does not take place quickly, in coitu, it either does not take place at all, or with difficulty. If the state of the glans be such, as to prevent a sudden and great action, in that part, no emission follows; and this is one cause of impotence.

† It might be thought, that, as inflammation of the intestines produces nausea or vomiting, so gastritis ought to be attended, uniformly, with looseness. But it is to be remembered, that the same causes produce very different effects on differ-

The liver and stomach are also connected with one another. When the liver is inflamed, or has its action increased, the stomach is weakened, and dyspeptic symptoms take place. When the stomach is weakened, as, for instance, by intoxication, then the action of the liver is increased, and a greater quantity than usual of bile is secreted. The same takes place in warm climates, where the stomach is much debilitated. If the liver has its action thus frequently increased, it assumes a species of inflammation, or becomes, as it is called, *schirrus*. This is exemplified in habitual dram drinkers, and in those who stay long in warm countries, and use freedoms with the stomach. The liver likewise sympathizes with the brain; for when this organ is injured, and its action much impaired, as in compression, inflammation and suppuration have been often known to take place in the liver.\*

Besides this connexion of the stomach with the liver, it is also very intimately dependent on the brain, being weakened when the action of the brain is increased, as we see in inflammation of that organ. The brain, again, is affected with pain, when the stomach is weakened by intoxication, or other causes; and this pain will be often relieved by slowly renewing the action of the stomach by such stimuli as are natural to it, such as small quantities of soups frequently repeated. A slight increase of action in the stomach, at least if not of a morbid kind, affects the brain so as to produce sleep, diminishing its action. This we see in the effects of a full meal, and even of a draught of warm water. The stomach like-

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ent parts. What produces mortal sickness in one part of the alimentary canal, occasions violent pain in another; and the sensation and consequence of diminished action is different in different parts. Dyspepsia produces squeamishness in the stomach; but the same cause, affecting the intestines, occasions costiveness.

Gastritis may be accompanied with looseness; but, in this case, there must be some irritating cause in the intestines.

\* *Mem. de L'Acad. de Chirurg. Tom. III.*

wise sympathises with the throat, squeamishness and anorexia being often produced by inflammation of the tonsils. This inflammation is frequently abated by restoring or increasing the action of the stomach. Hence the throat, in slight inflammation, is frequently easier after dinner: Hence, likewise, the effect of emetics in cynanche.

The extremities of bones and muscles also sympathize in the same manner. When one end of a bone is inflamed, the action of the other is lessened, and pain is produced;\* for a painful sensation may result both from increased and diminished action. When the tendon of a muscle is inflamed, the body of that muscle often is pained; and vice versa.

Lastly, the external skin sympathizes with the parts below it. If it be inflamed, as in erysipelas, the parts immediately beneath are weakened, or have their natural action diminished. If this inflammation affect the face or scalp, then the brain is injured, and head-ache, stupor, or delirium mite, supervenes. If it attack the skin of the abdomen, then the abdominal viscera are affected, and we have vomiting and purging, or obstinate costiveness, according to circumstances, as explained in a note to a former part of the text. This is illustrated by the disease of children, which is called by the women the bowel live, in which the skin is inflamed, as they suppose, from some morbid matter within.

If the internal parts be inflamed, the action of the surface is diminished; and, by increasing this action, we can lessen or remove the disease below, as we see daily proved by the good effects of blisters. When the stomach, intestines, or kidney, have been very irritable, I have known a sinapism act like a charm; and in the deep-seated inflammations of the breasts, bowels, or joints, we know of no better remedy, after the use of the lancet, than blisters. The utility of issues,

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\* To give only one example; in morbus coxarius, the knee is painful.

in diseases of the lungs, the liver, and the joints, is to be explained on the same principle. In these cases, we find, that issues do little good unless they be somewhat painful, or be in the state of healthy ulcers. An indolent flabby sore, however large the discharge (which is always thin, and accompanied with little action,) does no good, but only adds to the misery of the patient. We may, however, err on the other hand, by making the issues too painful, or by keeping them active too long; for, after they have removed the inflammatory disease below, they will still operate on these parts, lessening their action, and preventing the healing process from going on properly. This is seen in cases of curvature of the spine, where, at first, the inflammation of the vertebra is diminished by the issues; but if they be kept long open after this is removed, they do harm. We often see the patient recover rapidly, after his surgeon has healed the issue in despair, judging that it could do no farther service, but only increase the weakness of his patient.

It is a well established fact, that when any particular action disappears suddenly from a part, it will often speedily affect that organ which sympathizes most with the part which was originally diseased. This is best seen in the inflammatory action, which, as practical writers have well observed, occasionally disappears quickly from the part first affected, and then shows itself in some other.\*.

From the united testimony of all these facts, I may certainly maintain the doctrine which I proposed to prove, and introduce it into pathological reasonings. In the whole of the

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\* In the cynanche parotidea, the testicles or breasts often swell in proportion as the inflammation leaves the parotid gland. There are many instances in which the increased action of the parotid gland, in mercurial salivation, has subsided suddenly, and affected the stomach with intolerable irritability. The cessation of the inflammatory action of the urethra in gonorrhœa, and its consequent appearance in the testicles, has been already mentioned, and will afterwards be more fully considered.

animal economy, we discover marks of the wisdom of the Creator; but, perhaps, in no part of it more than in this, of the existence of the sympathy of equilibrium: for, if a large part of the system were to have its action much increased, and all the other parts to continue acting, in the same proportionate degree as formerly, the whole must be soon exhausted, (for increased action would require, for its support, an increased quantity of energy.) But, upon this principle, when action is much increased in one part, it is, to a certain degree, diminished in some other. The general sum or degree of action in the body, is thus less than it otherwise would be, and, consequently, the system suffers less.

### *Of the Actions of the Nervous Energy.*

Having made these general observations upon the nervous system, I come now to consider, more particularly, its different operations or actions. These, we have seen, are always induced by agents, which are to be considered as external; and these agents are called stimuli. The action or operation which is produced, depends, first, upon the nature of the stimulus; and, second, upon the property of the nerve.\*

Every state of the system is produced by an operation of the nervous energy; and this operation is called an action.

Almost every substance produces some change upon the system; and these changes may all be called diseases, if, by this term, we understand a condition of the nervous system, not entirely the same with the natural state.

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\* There are many nerves, which have, ab initio, a certain function or property allotted to them, which is excited by the application of some particular or specific stimulus. But after this peculiar action of the nerve is fully established, it is not always necessary, for the performance of these actions, that the specific stimulus be applied. Light, for instance, is not always requisite, for the sensation or action of vision, nor air for hearing; the application of zinc and silver, &c. being capable of producing these.

It has been already mentioned, that the living principle, if not acted on, would exhibit no phenomena; and that, although it should be present in any body, we should still, were there no action produced, conclude that body to be dead. The term life, in common language, is applied, not to the living principle, but to its evident operations, or actions. These are produced by certain fixed and determinate agents, which act constantly, and produce what is called the healthy, or natural action, (or, in common language, life.) If we apply other agents than those which are natural, we modify, or change the action; and, in proportion as the new action differs from the natural one, so is it dangerous to the system. These actions may be considered as different varieties of life, if we use this term in its vulgar acceptation; but these varieties, or, at least, many of them, not being fitted to our frame, we cannot exist long with them, more than we could, were the specific life, or congeries of actions of a quadruped, to be excited in us by any magical power.

It must evidently appear difficult, to every one who thinks upon the subject, to say, how foreign agents operate on the living principle of man, or how a small particle of matter, taken from the bowels of the earth, should excite a dangerous and mortal action of the vital power of an animal. In order, in some degree, to explain this, I may observe, first, that no two inert bodies can act on each other; or, in other words, that matter alone cannot act on matter, unless it be possessed of some active power: Neither is it possible for an inert body to act on one possessed of this enlivening principle; for the very capability of producing or exciting action, implies activity. Unless, then, both agent and actor possess some property different from mere matter, or matter truly dead, no change can be produced. Were the sun to lose its active power, or attraction, it could no longer act on any of the planets; and were any of the planets to lose their power,

they could no longer be acted on by the sun, or by other planets. If, then, it be admitted, which none will deny, that action can only be produced in a body which is alive, and by an agent possessed of an active principle, it will follow, that no action can be excited in an animal, except by means of the active principle of the agent which immediately excites it.

I shall, secondly, observe, that, as the vital principle, in animals and vegetables, admits of modifications, in the different individuals with which it is connected, so also does the vital or active principle of common matter; and it is these modifications which produce the essential and characteristic qualities of the different individuals, or different kinds of matter. Chemistry teaches us, that there are not many kinds of matter radically different; and, it is not extravagant to believe, that, were science improved, or, were the whole mystery of creation unfolded, we might find, that there was only one radical kind of matter, which, by its modification, yielded different products. The specific, or differential qualities of matter, never can be supposed to depend upon any cause, inseparably connected with mere matter, but must depend upon the operation of a distinct and active principle. We may mix different species of matter together, taken from the vegetable or mineral kingdoms; but we shall not make a new substance, unless the active principle operate, and become modified, converting the whole into a new individual.

In the third place, I remark, that a modification of a cause must produce an alteration in the effect.

From these three observations, I think we may understand, first, how foreign agents are capable of acting on the body; and, second, why different agents should excite different actions.

I may further observe, that it is only the attractive principle, or life of matter, which operates on animal life, exciting

it to action ; and it is only in so far as living animals, or vegetables, possess properties in common with common matter, that they can excite action in another animal. Hence, when applied to the body, or taken into the stomach, they can only excite the simple actions productive of the sensation of feeling : But, after the animals, or vegetables, die, that is to say, part with their specific life, and become the same with common matter, then they can excite peculiar and varied actions ; then, but not until then, can they be changed, and rendered useful as food, and not until then, do they ever act as medicines.

It is upon the principle now mentioned, of agents, or stimuli, acting only on the body, by means of their active principle, that we are to explain the influence of these larger masses of matter, the sun and moon, upon the human body. That these affect the body, both during health and disease, has been so fully admitted, by so many attentive physicians,\* that I shall consider the fact as established, and requiring no farther evidence in this place.

The operation, or action, of the system, in the healthy state, can scarcely be described ; because it comprehends and produces every circumstance connected with health ; such as, sensibility, muscular contraction, absorption, nutrition, digestion, and all the other functions of the body. These operations, taken collectively, may give some idea of the natural or healthy action. This action is much too extensive and intricate to be described, or defined ; but it may be understood, by observing the general condition of a healthy person.

The presence of this action, seems also to be requisite for the support or renewal of the energy which produces it ; for, if the action be suspended, or totally changed, the functions

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\* See the Works of Mead, and, more lately, the Observations of Jackson, Balfour, &c.

cease ; all energy is lost, and death takes place. Whilst the action, then, depends upon the power, the power depends, for its continuance, upon the action.\* Hence, when agents capable of exciting an action, very different from the natural one, are applied, we may readily perceive, how weakness ought to be the consequence : On the contrary, if the natural action be gradually increased, and remain unchanged, strength will be produced.† If, however, the increase of action has been more sudden, and to a greater degree, we find, that it is changed in its nature, and is no longer healthy, as we see in inflammation, in which we have no production of strength, but, on the contrary, an expenditure of power. The same thing happens, when particular functions are increased in their action ; such as, muscular motion, secretion, &c.

The nervous system has its energy supported, and its healthy actions excited, by arterial blood, which may, therefore, be called a natural stimulus. Heat, air, and food, are likewise necessary stimuli ; but these all act, either by preparing the blood, or imitating its operation. Food and air give to the blood its most valuable qualities ; and heat, appli-

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\* We have seen, that the vitality of animals is received from common matter, the active principle of which is gradually changed, and rendered more perfect. It is from the life of the blood, that all energy is immediately derived, being, in the brain and nerves, elevated to the greatest degree of perfection. This is, undoubtedly, the effect of some action ; for it is not done by any innate quality, inseparably connected with vitality itself ; otherwise, we might find it raising itself to different degrees of perfection, in the very lowest orders of the creation. This action is not seated in the blood ; otherwise, we should find the life more perfect than it is, in the blood ; but it is to be found in the nervous system, which performs all the actions and operations of the body, by means of a living principle, which, by its operation, enables it to renew the energy, or power. The nerves alone cannot do this ; for it implies an active operation, which they cannot perform without life.

† If, by any means, the energy could be increased, without a previous increase of action, (which, however, is impossible,) we should, in all probability, have an immediate increase of action. Increase of energy, and increase of natural action, singly, ought to produce the same effect.

ed externally, only co-operates with that fluid, which produces it in a certain quantity, by the action of the living system.

When other agents operate on the system, a different state from that produced by the blood, is induced in the body. Wine, opium, contagions, mercury, &c. being all capable of operating on the system, produce an action, which, of necessity, must be different from the natural action, inasmuch as these agents differ from the natural agent.

New agents sometimes appear to increase the natural action, but this, it is evident, they never can do, without changing or modifying it in some respect;\* and, therefore, the opinion that they produce diseases, consisting entirely of different degrees of strength, or natural action, is absurd. When any stimulus has been applied to a part, so as to produce inflammation, it has been supposed merely to increase the vigour of the part, or, in the language of Dr. Brown, to increase its sthenic diathesis. But the whole series of symp-

\* No agent can excite an action perfectly similar to the natural one, unless it be a stimulus, which is habitually present, such as, arterial blood and heat. Electricity appears to increase the natural action, or whatever action is going on at the time of its application, in the same way with heat; but we cannot call electricity a new agent; for it certainly operates, habitually, on our system, although as yet, we are much in the dark respecting it.

Those agents which are natural to the system, are found to increase every action which is going on, whether healthy or diseased. Hence, blood and heat will support, not only the natural action, but also any other which has been induced.

This may explain to us the use of heat in medicine, and may also inform us, what effects we are to expect from it. In warm climates, some functions, or parts of the natural action, are increased, beyond that relation which ought to subsist betwixt them and the power, and weakness is produced. All the secretory actions are increased, at least, such as are not incompatible with each other; such as the secretion of urine, and sweat, which cannot both be increased in quantity at the same time. All morbid actions are increased; and hence the danger of diseases in warm climates. The fever is violent, and runs its course rapidly: The action in ulcers is far beyond the power, and the destruction is great: The contagion of dysentery acts powerfully, and a few hours decide the fate: Blood, like heat, increases actions; and hence the truth of the old observation, "That full-blooded people bear disease worse than the spare."

toms, in that disease, show, that a new action is produced, differing very much from the natural one, both in its progress and consequences, as will be evidently seen, when we come afterwards more fully to examine it. The variolous matter, again, at the same time that it induces the inflammatory action, modifies it, and, in a very striking manner, changes its nature.

Some actions appear to arise without any evident cause, or to be repeated, by what is called habit ; but, in order that this may take place, it is necessary, first, that the action have been, at some former period, strongly excited, or long continued, or frequently repeated : Second, that either some stimulus be applied, which has been frequently applied during the former continuance of the action, and which had been accustomed to increase it ; or, that some stimulus be applied, which, in its effects, bears a resemblance to some part of the former diseased action, which is thus renewed. Thus, if a person has once had an ague, he is apt to have a return of it, whenever he is exposed to much cold, which induces a state similar to the former cold fit.

In all morbid actions, we have three periods to attend to :

First. The period of formation, in which the animal is weakened, by the diminution of the natural action, or functions, during the time that the new action takes to form ; for diseased actions never take place suddenly, (unless the exciting cause be very powerful, and applied only to a particular part, producing local disease,) but a certain time is required for their formation. The weakness induced in this way, will be observable in every general action, and even in those which, when fully formed, are called inflammatory. The symptoms which take place, during the formation of an action, are lassitude,\* anorexia, coldness, head-ach, and thirst.

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\* This proceeds, in a great measure, from the diminution of the action of the muscles. In many instances, this diminution of natural action is productive of a

These always occur, and precede actions, the most dissimilar one to the other.

Second. The period in which the action exists in perfection, and fully formed, marked by the peculiar characters of the action; such as, heat, pain, and redness, in inflammation; eruptions, in the exanthematæ; peculiar indescribable condition in typhus, &c.

Third. The termination. All new actions terminate by a secretion. In the inflammatory action, we have either a secretion of matter, similar, or nearly similar, to the natural substance of the part, producing adhesion, or resolution, as it is called; or a secretion of a fluid, called pus, serum,\* &c. In many other actions, however, we have no new secretion formed, but only an augmentation, and perhaps, slight change, of some natural and accustomed discharge; such as, sweat, urine, or, occasionally, the intestinal mucus. These discharges, or secretions, are sometimes in small quantity; but, at other times, they are more considerable and evident. By the attentive ancients, they were called critical, as they were often seen to occur in the end of the disease.

Although all actions terminate in a secretion, yet it does not follow, that, whenever the secretion appears, disease is to end. The reverse is too often the case; for, in many species of inflammation, the secretion continues permanent, unless we interrupt it by art. In all acute diseases, however, or in those which are called febrile, the secretion does not continue permanent; and, in all eruptive actions belonging

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very painful sensation, which is felt in most of the muscles, and which causes the patient to complain of pain in his back and in his bones, whilst in reality it is the muscles alone which are pained. Sometimes this diminution of natural action is productive of spasmodic affections. I have known fevers ushered in by convulsions of the whole muscles of the body, especially of the spine, and these continued during the period of formation.

\* Pus is the most common secretion, terminating inflammation; but it may also end in a secretion of thin fluid, like serum, producing a dropsy of the affected part. This is too frequently fatally seen in the head and chest.

to this class, the action terminates, whenever this secretion is completed; and the patient is then subject only to the weakness which the action may have induced, and to the effects which the eruption, considered as simple ulcers, may now produce. This is seen in the small-pox, chicken-pox, &c.\*

Actions are only known and distinguished by their effects; and many of these are of such a nature, as not to be cognizable by the senses; such as, the peculiar or specific state of the body, in typhus fever, small-pox, &c. The precise nature of these conditions, can neither be described nor understood; because they cannot be brought under the examination of any of our senses. Some have, therefore, denied their existence altogether, or have not perceived it.

In almost every system of nosology, they have been entirely overlooked, the classification being founded upon such general and sensible deviations, as occur in every action, over and above the peculiar condition; such as, affection of the circulation, pains, eruptions, &c.

Some actions are confined to a particular part of the body, whilst others affect the whole system; and, therefore, nosologists have uniformly separated these diseases from each other; and, at first sight, we might conceive, that the primary and great division of diseases might be taken from this source. But, by maturer consideration, we shall find that the distinction is erroneous; because there is no local disease whatever, which, if either increased in degree, or continued for a long time, will not affect the constitution, and induce a general ailment. On the other hand, there is no action which affects every part of the body equally; and, therefore, there is no general disease without a local one; or, in other words, there is always some part of the body, in every disease, more af-

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\* I have seen the measles appear, before the pustules of the chicken-pox were quite gone, which could not have happened, unless the general disease, or peculiar action, had disappeared, when the secretion took place.

fect than the rest. In the exanthemata, the skin is most affected; in fevers, strictly so called, the head is generally most affected, although sometimes the lungs or abdominal viscera suffer most. Of all the parts of the body, however, the brain generally is affected in the greatest degree, unless the disease be induced by some cause acting locally on other parts; but, even in this case, if the disease be violent, an affection of the head is superadded to the other local disease. This is exemplified, in the case of those who die after wounds or operations; in which event, the brain is commonly found turgid, and the patient, not unfrequently, is affected with coma before death. In certain diseases, we observe a series of aptitudes of the different parts of the body to be affected, as will afterwards be particularly illustrated in the venereal disease. In all actions, the least sensible parts suffer latest. This we see in the case of the bones, tendons, and cartilages.

Actions produce different symptoms, according as they are extended over the body. Such as affect the whole system, produce undefinable uneasiness, frequency of pulse, heat, and the other symptoms of what is called fever. But, when action appears in one part more than the rest, as it always does, that part is affected with what we call pain; and, if the action be still more increased in it, we have a species of inflammation induced. This is illustrated by every disease which we know of; for, in common fever, in small-pox, and every specific action, we find inflammation produced, whenever action becomes much concentrated in any part.\*

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\* Inflammation in a part, is intimately dependent on the state of the vessels. All actions, which produce perceptible disease, affect the vessels, making them contract more or less frequently, and more or less strongly. We may, therefore, see how any action, when greatly increased in a part, may induce inflammation.

Instead of adhering to the more established modes of classing diseases, it will better answer the present purpose, to divide actions into the six following classes.\*

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## CLASS I.

### *A. Naturales.*

Alterations in the performance of the natural action of a part of the body, or of the whole system, but not to such a degree, as materially to change its nature, or render it new.†

**Order 1. IMPERFECTÆ.**—A diminution, interruption, or irregularity of the performance of some part, or the whole of the natural action.‡

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\* This arrangement will, it is true, bring together diseases, which have often been far separated; and is likewise very imperfect, because no more than an outline of the classification can be given here. The minuter subdivisions, arising from the action being general or local, and from the function, chiefly impaired, or other circumstances, cannot be noticed in this sketch. If these were inserted, (which would take more room than can be properly spared to it,) many of the imperfections and apparent inaccuracies would disappear; but no system of nosology ever has, and, until our knowledge be increased, ever can be free from fault. As for the circumstance, of bringing together diseases or actions formerly separated, I have only to remark, that the same license ought to be allowed for uniting them, as for separating them, both proceeding on arbitrary or assumed principles. In this arrangement, the actions are classed, not altogether according to their cause, but chiefly according to their evident effects or symptoms, which is the most useful way; the object of medicine as yet being almost totally confined to the removal of symptoms. To comprehend all the diseases of the human body, another class, consisting of actions of the mind, ought to be added.

† We shall afterwards find, when we come to consider inflammation, that if the whole natural action of a part be much increased, it becomes changed in its nature and effects: But the present class comprehends these changes only, which take place to such a degree, as not to alter the nature, or destroy the characteristic marks, of the natural action.

‡ This order may be subdivided, according as it affects the different functions, &c. and comprehends spasm, epilepsy, palpitation, asthma, dyspepsia, choleric, chlorosis, torpor from cold, &c.

*Order 2. ACCRESCENTES.*—Some part of the natural action morbidly increased, without being materially changed in its nature.\*

*Order 3. INEQUALES.*—A loss of balance betwixt some part of the natural action.†

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## CLASS II.

### *A. Transpositivæ.*

A transposition of the natural action of some part of the body to another part, which, in health, possesses a different action.

*Order 1. FORMANTES.*—A transposition of the action which forms the part.‡

*Order 2. SECERNENTES.*—A transposition of some secretory action.||

*Order 3. SYMPATHETICÆ.*—Actions transferred, by sympathy, from the diseased part to one which was formerly healthy.\*\*

\* This will comprehend cholera, diarrhœa, menorrhagia, &c.

† This comprehends the different varieties of dropsy. In this disease, the secretion and absorption do not balance each other.

‡ When the muscle-forming action is lost in the arteries, and membrane is produced in its place, aneurism is the consequence. When the action of forming bone is transferred to the heart, a very serious disease takes place. When the action of the vessels of the tunica sclerotica is transferred to the crystalline lens, cataract is produced.

|| There are instances recorded, of the purulent secretion being transferred to some part which formerly was sound. There are many cases, where the menstrual discharge has come from different parts of the body.

\*\* This order is founded on the doctrine of the sympathy of equilibrium, which has been already explained.

## CLASS III.

*A. Similes.*

Actions which, when analysed, are found to bear a resemblance to the natural action, which is increased to such a degree, as to become changed in its nature.\*

*Order 1. INFLAMMATÆ.*—Actions producing heat, redness, pain, and more or less swelling, in some particular organ, often attended with pyrexia.†

*Order 2. STIMULANTES.*—A general increase of action, (without such a local affection as to produce true inflammation in the part,) marked by frequency of pulse, heat of the skin, thirst, and pain or confusion in the head.‡

*Order 3. SANGUINANTES.*—A discharge of blood from the vessels of a part, without any artificial wound, accompanied with a general action of the system.||

*Order 4. TONICÆ.*—Actions consisting in an increased contractile power, nearly, though not entirely, similar to the natural action.\*\*

\* The change of the nature of an action, from a change of its degree, will be afterwards illustrated, in the dissertation on inflammation.

† This order comprehends the pblegmasiæ of nosologists.

‡ This comprehends the slight febrile attack called ephemeræ; the action induced by wine, spirits, hartshorn, &c. In these there is always some part more affected than the rest; but this superior affection must not be to such a degree, as to produce inflammation; otherwise the action will belong to the order inflammation.

|| This comprehends the order hemorrhagia of nosologists. The subdivisions are founded on the part affected. Apoplexy belongs to this order, being produced by a hemorrhagic action in the brain.

\*\* This is entirely confined to the effects of those agents called medicines; such as, alum, galls, bark, bitters, &c. These are often used to strengthen the body; because they excite an action nearly similar to the natural one; and, if given gradually, they do in the end in reality increase the healthy action, by having for so long induced one in an increased degree, which nearly resembles it.

*Order 5. HECTICÆ.*—Frequent pulse, weakness, sweats, and purging, heat of the skin, flushed face, thirst, wasting of the body, without any specific action.\*

*Order 6. MECHANICÆ.*—General action, dependent chiefly on some local cause, acting mechanically.†



## CLASS IV.

### *A. Dissimiles.*

Actions very dissimilar to the natural action, and which may be called specific.‡

*Order 1. INTERMITTENTES.*—Actions which alternately disappear and return, or remit and increase, for a certain time.||

*Order 2. TYPHOIDES.*—Great prostration of strength; pulse frequent, sometimes full at first, but always small, after the disease has continued for a short time; pain in the head, with disturbance of the mental faculties; urgent thirst, with foul tongue.\*\*

*Order 3. VENENOSÆ.*—Great weakness, often attended with eruptions, or other local affections, produced by the application of what are called poisons.††

\* The different species of phthisis, atrophy, &c. are to be placed here.

† Of this kind is jaundice, proceeding from biliary obstructions.

‡ These are, of all actions, the most dangerous, on account of the great and rapid weakness which most of them induce. Some call the agents productive of these, sedatives; but the name is improper, for they are very far from soothing. *Agentes dissimiles*, is, from the poverty of language, the best I can fix on.

|| Such as the different varieties of intermitting fevers.

\*\* Comprehends typhus, plague, cynanche maligna, the disease produced by the application of putrid matter to the body, &c.

†† The bite of many snakes, the effects of lead, laurel, &c.

## CLASS V.

*A. Mixtæ.*

Actions which are of a mixed nature, resembling in part the class Similes, but having also some peculiar or dissimilar action united to this.

*Order 1. ERUPTURÆ.*—Actions producing numerous inflammations of the surface, combined with a specific action, often ending in ulceration.\*

*Order 2. IMMUNDÆ.*—Actions consisting in specific inflammation, not necessarily confined to the surface, and generally ending in ulceration.†

*Order 3. GLANDULARES.*—Specific actions, producing a change in the quality and appearance of some natural secretion, which is, at the same time, generally increased in quantity.‡

*Order 4. ULCERANTES.*—Actions consisting in simple ulceration of a part, without any specific condition being conjoined.||

*Order 5. CONNATÆ.*—Morbid actions which are received at conception.\*\*

*Order 6. NARCOTICÆ.*—Actions producing frequency of pulse, stupor, or sleep, with a disturbance of the imagination, and an inflammatory or hemorrhagic action of the brain, if excited to a sufficient degree.††

\* Such as small-pox, measles, scarlatina, cow-pox, &c.

† Such as syphilis, cancer, elephantiasis, frambesia, phagedena, &c.

‡ Gonorrhœa belongs to this order.

|| This order comprehends ulcers, succeeding to simple inflammation, which may properly enough be placed under the class Mixtæ, as the granulating action is a natural one, and the purulent action an unnatural one.

\*\* Such as scrophula.

†† Such as the actions of opium, hyocyamus, belladonna, &c.

*Order 7. DIMINUTÆ.*—The natural action chronically impaired, and some peculiar or specific action conjoined.\*

*Order 8. ADAUCTÆ.*—An increase of some function, or part of the natural action, conjoined with some specific condition.†

*Order 9. IRRITATÆ.*—Increased and specific actions of the system, productive of local inflammation, if excited to a sufficient degree.‡

## CLASS VI.

### *A. Mentales.*

Morbid conditions, seated either entirely in the mind, or operating on the body, through the influence of the mind, or on the mind, through the influence of the body.

*Order 1. IDIOPATHICÆ.*—Conditions consisting entirely in some mental derangement, without any considerable alterations in any of the functions of the animal.

*Order 2. CORPOREÆ.*—Alterations in the functions of the body, in consequence of some morbid operation of the mind.

*Order 3. SYMPTOMATICÆ.*—An affection of the mind, dependent on some disease of the body.

\* Such as scorbutus.

† Pertussis, diabetes, &c.

‡ This differs both from the order *Inflammatæ* and the order *Stimulantes*, by having a specific action conjoined with the general or local increase. It comprehends the actions of mercury, arsenic, copper, nitrous acid, &c.

Every new or morbid action has naturally a certain course which it is inclined to run, or a certain series of symptoms or effects which must be produced, before it can be removed. When this course is accomplished, and the action has become complete, many of them disappear, and the natural action returns in perfection. This is illustrated by the actions of wine, of common inflammation, of mercury, and of typhus fever. Others, as, for instance, intermitting fevers, having run one course, begin another, exhibiting a series of alternations betwixt health and disease. In syphilis, again, and some other diseases, we find, that the action, when completed and made perfect, continues in that state without diminishing or disappearing.

By a knowledge of the facts already mentioned, we cure diseases, or remove dangerous actions. Certain actions, we have seen, disappear spontaneously, after having run their course: These we may, therefore, either altogether neglect, or, if this be imprudent, on account of their violence, we may attempt to make them run their course more speedily. When a part becomes inflamed, we find, that the symptoms continue increasing for a time, and then lessen, leaving the part either healthy, or in possession of another action, called the purulent. In this disease, then, we have an augmentation, an *acmé*, and a decline. When we attempt to diminish this action, we make that period, in which we begin our treatment, the *acmé*, and the subsequent one the decline. In this case, it is often, though not always, comparatively speaking, of little consequence, whether we endeavour, by art, to complete the action speedily, or allow it to follow its course more extensively and tediously. But, in the typhus fever, the danger is always increasing, in proportion to the duration of the action; and, therefore, we ought, if possible, to complete it speedily. This we endeavour to do, in the very begin-

ning, by an emetic, which, inducing the hot and sweating stages, often terminates the action.

There are other actions, however, which, we have seen, have no tendency to disappear, after all the stages are gone through. Of this kind, amongst many others, are intermittent fever and syphilis. In these diseases, then, we must unavoidably follow, in every instance, that course, which, in inflammation, we may or may not pursue, as circumstances direct; namely, diminish the morbid action, by artificially restoring the natural one. In inflammation of strong parts, we might, by induction, discover the method of restoring health; for, if the disease consists in the natural action, increased to such a morbid degree as to change its nature, it is plain, that whatever would, in health, diminish the natural action, must here be of service. But, in the cure of the diseased actions at present under consideration, we can derive no such assistance from reasoning or judgment, because we are not so well acquainted with the nature of these actions. We have, accordingly, been altogether indebted to empirism for a cure; but now, that the remedies are discovered, we can ascertain the principle on which we proceed. In these diseases, it is impossible to restore directly the natural action; because the morbid one will not yield to it. We are, therefore, obliged to destroy the diseased action, by inducing another which is able to displace it, in the same way as it had removed the natural one. But this is not all which must be done; for we should still have only exchanged one disease for another, unless we had been careful to remove the first and obstinate diseased action, by another which would disappear, after having run its course, and allow the natural one again to appear.\* To apply this to syphilis; it may be observed, that

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\* In the cure of diseases, we ought not only to attempt removing the morbid action, by inducing such another general condition as shall answer our intention; but also, to attend to the removal of particular symptoms of the ac-

the mercurial action is as dissimilar to the venereal action, as this last was to the natural one ; and, therefore, will remove it in the same way, and exactly on the same principle on which the venereal action had taken place of the natural one. This being done, the patient is cured of one disease, but still labours under another, namely, the mercurial action. When this subsides, he is well. In the same way, bark, arsenic, &c. cure agues.

Unfortunately, we are not able practically to apply this doctrine to the cure of many diseases ; but this inability results not from any fault of the doctrine itself, but from our own ignorance of the nature of various actions, which prevents our opposing one to another with success.\* Antimony has, by some, been proposed for removing the typhus action, cicuta for removing the cancerous disease, whilst the scrophula has been promised to be cured by the muriated barytes, and the small-pox to be prevented by mercury. But melancholy experience testifies the inefficacy of all these proposals, and the impossibility, as yet, of inducing an action capable of displacing these terrible diseases.

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tion, which will much co-operate with our general plan. In those actions, which we cannot yet cure by general remedies, we are confined entirely to this removal of symptoms ; and a proper interference, in this respect, by the application of such remedies as shall do so, without, at the same time, tending to increase the morbid action, considered as a whole, requires the greatest discernment of the physician. In fevers, and many other diseases, people are much weakened ; but he who should, from the beginning, attempt to obviate this by wine, would find the general action much increased by it, and his patient rendered worse.

\* It is a great loss to medicine, that distinctions have carefully been made betwixt what are called diseases, and what are called remedies. Do not the agents called medicines, and those which produce what we call disease, act all on the same principle ? Do not both classes produce diseases, or unnatural actions ? Might we not sometimes derive benefit from the actions which we call diseases, and which, in this case, we should find to be useful remedies ? This has, in part, been admitted by many, who have wrote on the good effects of fevers in removing other diseases. It would, however, be requisite, that we should never induce a more dangerous action, in order to destroy one less.

To conclude these observations, I may remark, that, although we may remove one action by inducing another, yet this cannot be done, until the first has gone through all the essential stages to become perfect. Thus, mercury will not cure the venereal action, until inflammation, which is essential to the perfection of that action, has taken place. The typhus action cannot be removed, without sweating, or moisture on the surface, or some other secretion. The natural action, being always at its acmé, or always complete, can be removed at any time ; and the same may be said of the inflammatory.

### *Of the different Systems of Pathology.*

From what has been said, it may appear, that we are to ascribe both the health and disease of an animal to the operation of the living principle. Until within these few years, however, physicians have been too apt to imagine, that the diseases of man were similar to the changes induced on common matter, referring them entirely either to an augmentation or diminution of his fluids, or to a depravation of the humours.

The different fluids of the body were all divided, by the ancients, into the natural, the secondary, and the unnatural humours. The *natural* humours, they said, were four in number : First, the phlegm, or pituita, which was prepared from cold and crude aliment, and in greatest abundance in old age, or the winter season, when the low degree of heat favoured its production. This pituita was formed in the brain, from whence it descended, to lubricate the joints, and dilute the blood : It nourished and supported the brain, and the cold parts of the body.\* Second, the choler, or

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\* The different parts of the body were supposed to be either hot or cold, dry

yellow bile, which was prepared in the liver: It was of a very hot and fiery nature; and, therefore, nourished the hot parts, at the same time that it corrected the pituita, and purged the intestines. Third, the atra bilis, or melancholic humour: This was prepared in the spleen, which it nourished, as well as the drier parts of the body; it likewise promoted appetite. Fourth, the blood, which was prepared in the liver, from whence it was sent to all the different parts of the body, going out by day to the extremities, and returning by night to the more noble parts.\*

These humours were supposed to operate more at one time than another, or to reign alternately; and, upon this conjecture, they explained, why certain diseases were worse at particular hours; the humour which produced them being then in its greatest force. The blood reigned from three o'clock in the morning until nine; the choler, from nine in the morning until three o'clock in the afternoon; the black bile, from this hour until nine in the evening; and the pituita, from nine until the blood began again its reign.

The *secondary* humours were the invention of the Arabians, and were said by them to be the different steps toward nourishment: They were furnished by the blood, when it came to the part which was to be nourished.

or humid. The brain was one of the cold parts, and was supposed, by Aristotle, to moderate the heat of the heart. Aristot. de Part. Anim. cap. vii. lib. 2.

\* "Mundus quatuor ex elementis consistit, igne, aëre, terra, et aqua: calido videlicet humido, frigido, et sicco. Iisdem ex elementis quatuor totidemque humoribus et homo consistit; sanguine scilicet, pituita, flava, et atra bili. Et sanguis quidem aëri, pituita aquæ, flava autem bilis igni, atra vero terræ simulatur. Sanguis enim gustu dulcis est; pituita, salsa; flava bilis, amara; atra vero ascetosa, et flavescens. Sanguinis autem locus, et spiritus in corde est. A dextris quidem ejus sanguis, a sinistris vero, spiritus consistit. Flavæ bilis in jecinore; atræ in liene; pituita quidem in cerebro, locus. Sanguis autem calidus et humidus; pituita frigida et humida; flava bilis, calida et sicca; atra vero sicca et frigida."

*Hippocr. de Hom. Struct. ad Perdicam, &c.*

The *unnatural* humours were those which were perverted and diseased; and then, whatever might have been their former quality, they become hot. The blood\* and melancholy corrupted only in the veins; the other two humours corrupted out of the vessels.

These humours were supposed to possess different qualities, which they communicated to the body, and upon which depended the peculiar properties of the body, considered either as a whole or a part. These states were called conditions, or temperaments, or constitutions; terms which are still retained, and meant to express the peculiar habit of body; as, strong, weak, scrophulous, &c.†

The peripatetics, by the term temperament, or temperies, meant the condition of the body, with regard to the proportion of elements which it contained. The blood was said to be hot and moist; melancholy, cold and dry; choler, hot and dry; phlegm, cold and moist. According, then, as these humours preponderated, the body was said to possess a cold, hot, dry, or moist quality, condition, or temperament: And as these states were produced by the presence of the humours, physicians at last came to name the temperament, from the humour which produced it, instead of the quality which it imparted. Thus, we had the sanguineous, choleric (or bilious,) melancholic (or atrabilian,) and phlegmatic (or pituitous) temperaments, with many admixtures of each other, as, for instance, the sanguineo-choleric, &c.

When the doctrines of the ancients came to be more fully commented on, the temperaments were more minutely sub-

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\* When the blood corrupted in its thicker part, it turned into melancholy; but when its thinner part was in fault, then it became choler.

† Instead of adhering to the old names, which depended upon the ancient theories of physic, practitioners have substituted a variety of new ones, corresponding to their own opinions; such as, phlogistic, cahectic, sthenic, asthenic, irritable, &c.

divided and explained. The temperies bona consisted, in a due proportion of all the qualities capable of being possessed by a body ; such as, heat, cold, dryness, moisture, density, rarity, hardness, softness, visciduity, volatility, &c. The temperies was called moderate, when the qualities were of a moderate degree ; immoderate, when they went beyond moderation. It was called total, when it affected the whole body ; and this, again, was divided into the sanguineous, melancholic, bilious, and pituitous, according as these humours predominated. It was called partial, when the condition of different parts was considered individually. Thus, the brain was cold and moist ; the heart, hot and moist ; the bone, dry and cold ; and a regular gradation, or series of changes, was established betwixt these, consisting of parts which possessed these qualities in an intermediate degree ; the cartilage, for instance, was not so dry or cold as the bone, &c. It was called native, when it was received at conception ; communicated, or unnatural, when changed after birth : And the chief causes which induced these changes, were age, the season of the year, climate, and habits. It was called permanent, when it depended on the formation of the part ; temporary, when it depended on the fluids.

The intemperies, or bad temperies,\* was divided into the manifest and occult. The manifest was either simple, when only one quality was morbidly increased, producing the warm, dry, or cold intemperies, for example ; or complex, when more than one was in fault, producing the dry and hot intemperies, &c. The occult was produced by some hidden vice ; such as poison, contagion, &c.

Besides the natural humours, upon which the temperaments depended, and which were the cause of most diseases,

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\* “ Bona temperies est pars sanitatis, quæ in qualitatibus conveniente constitutione consistit.”—“ Intemperies est morbus, qui in qualitatibus corporis inconvenientia consistit.” *Regii Lib. Med.* p. 5. et 24.

the ancients likewise admitted the existence and operation of three different spirits, the natural, the vital, and the animal; and also the same number of faculties, called by the same name, which were the efficient causes of the different actions, in the performance of which the spirits were the instruments.

The natural spirit was supposed to be some fine exhalation from good blood, or some very delicate substance, prepared in the liver, from the blood and air.\* This was the thickest and poorest of all the spirits, and was contained in the veins: It was the source of nutrition, and conducted the blood and natural faculty to all the different parts of the body. Some physicians, from considering, that no air could reach the liver, or, if it did, that there were no cavities in it, to form the natural spirit, doubted of its existence, and were confirmed in their scepticism, by observing, that there were no ducts leading from the liver capable of conveying it away; for they could not believe, that the thin coats of the veins could contain it. These difficulties, however, were readily overcome; for, as Hippocrates had declared, that "*omne corpus transpirabile est et transfluxile*," it followed, that the air might reach the liver, through the diaphragm; and as this spirit was thick, it followed, that the veins might contain it; and, being slowly produced, that no cavity was requisite for its formation.

The vital spirit was prepared in the left side of the heart, from air and blood; and it was this union which produced the pulse. Physicians readily explained, how the air, taken in by inspiration, was prepared in the lungs, and conveyed, by the *arteria venosa*, or pulmonary vein, to the left auricle of the heart: But they found it more difficult to settle the

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\* Every spirit was supposed to be formed from the blood, the thickest parts forming the lowest kind of spirit. These spirits were called the vehicles, through which the different faculties operated.

controversies which arose concerning the way in which the blood reached that cavity. According to Galen, the blood underwent some attenuation and preparatory change in the right side, whence part was sent, by the pulmonary artery, to nourish the lungs ; while the rest was transmitted, through small foramina in the septum, to the left side. Columbus denied these pores to exist, and maintained, that the blood went from the one side to the other, by the circulation, which is now admitted and established as a fact. Botallus invented a particular duct for this purpose ; whilst Ulmus laughed at all these conjectures, and taught, that the blood underwent its preparatory change in the spleen, from which, by means of the aorta, it reached the left side of the heart. The blood and the air having, then, by some means or other, got together, they formed the vital spirit, which was contained in the arteries, where it could be felt bounding and jumbling, and by which it was conveyed to every part of the body, vivifying and preserving those parts which had been already formed by the natural spirit. " It maintains the heat, (says Laurentius,) brings out whatever is lurking, and recruits the exhausted. It shines by its own light, and displays itself in every part of the theatre of the human body ; and, being diffused over it, every part rejoices, and appears with a rosy colour. When destroyed or intercepted, the whole shivers, becomes pale, and dies."\*

The animal spirit was the finest of all, and could not be confined within the coarser vessels. It was supposed, for a long time, to be prepared in the anterior ventricles of the brain, from the vital spirit, which ascended by the carotid and cervical arteries, and the air which was taken in by the nostrils during respiration. That this was the case was con-

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\* Laurentii Opera, p. 569.

sidered to be proved; because, whether the carotid were tied, or the breath of the nostrils stopped, the same effect, namely, apoplexy, was produced, the generation of this spirit being, in both instances, equally checked. When the circulation of the blood was discovered, and the arteries were found to be full of arterial blood, then this doctrine of the ancients was new-modelled. The arterial blood, which was full of spirit, was sent, by the vessels, to the brain, where its watery part was separated, and passed off by the pituitary gland, whilst its spirit, or finer part, formed the animal spirit.\*

Some denied the existence of this spirit, and thought that the vital spirit was sufficient for the operation of the body. Amongst these was Argenterius, who accused Galen of inaccuracy and contradiction; because, in one place, he attributes the generation of this spirit to the blood; in another, to the air; and in a third, to the vital spirit, which was said to form it, at one place, in the anterior ventricles; at another, in the plexus, or substance of the brain. But Laurentius† undertook to do away all these objections, and reconcile the apparent contradictions, by observing, that as the blood was necessary for the production of the vital spirit, and this spirit and air necessary for the generation of the spiritus animalis; therefore, all the three might properly be mentioned by Galen; and as for the objection, on account of the different places in which it was said to be produced, this also was a quibble; because it was prepared in the plexus and anterior ventricles, refined in the third ventricle, perfected in the

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\* De le boe Sylvius Opera Medica, p. 20.

† Laurent. Opera Omnia, p. 652.—This author was particularly angry at Argenterius, because he had denied, that the fluid which came down the nose, was the peculiar excrement of the brain, but was generated in the liver. “*Melhercule, (says he,) in doctrina Argenterii nullus est infundibuli, et glandulæ pituitariæ in cerebro temperatissimo usus.*” p. 661.

fourth, and diffused finally through all the substance of the brain and nerves.

This spirit, says Van Helmont, is the *impetum faciens* of Hippocrates, which holds the key of life in its hand. In the brain, it produced what are called the internal senses; when carried out of it by the nerves, it was the cause of motion, and the external senses. It has been already mentioned, that it was equivalent to the nervous energy of the modern schools.

Upon these humours and spirits, then, did the ancients found their system of physic.\* Obstruction to the free motion of the animal spirit, produced palsies, apoplexies, and convulsions; whilst, when the vital spirit was affected, the heat of the parts, and their life, could no longer be supported, and mortification took place. A redundancy of blood produced phlegmon: The pituita caused dropsy; or, when the blood was full of it, from "multiplied crudities," then it fell upon the joints, and swelled them: The choler produced jaundice, dysentery, and erysipelas; whilst the atrabilis, or melancholic humour, caused cancers; and, by "its fuliginous vapours ascending to the brain," brought on many disorders. These diseases were produced chiefly by an increased quantity of these humours; but, when they corrupted or changed, then no one pretended to estimate the evil which might follow. Nay, not satisfied with corrupting themselves, these humours enticed foreign contagions to combine with them, the venereal virus lurking in the pituita, whilst the measles lodged in the choler.

The practice which naturally followed from this theory, was to expel the morbid humour; but this they could not do, until by remedies, or the process of nature, it was concocted and prepared for evacuation.

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\* Disease, said they, is produced, by either a bad temperies, or by malformation of a part.

Although these were the prevailing doctrines concerning the cause of diseases, in the ancient schools, yet most physicians admitted the co-operation of an intelligent principle.\* To this principle, Hippocrates gave the name of nature, which he considers as of an excellent, and almost divine quality. This principle, we are informed, is heat;† by which term, however, we are not to understand him as meaning common fire, but a principle sui generis; for the ancients used this term in a very extensive sense. Thus, Aristotle‡ tells us, that the soul of man is heat; but cautions us from believing, that he means exactly any thing which we have ever seen in another situation. By comparing some passages of Hippocrates with each other, and with the writings of the philosophers who lived about that time, we shall find it to be most probable, that, by the operations and interference of nature, he meant the agency of the soul;|| a doctrine which

\* "Medicina id quod molestat tollit, id a quo homo ægrotat auferens, sanum facit. Natura eadem sua sponte novit." *Hip. de Dieta.*

† The original theory of animal heat, was, that a calor natus, or innate heat, existed in the left ventricle of the heart, which went out by the vessels, and supported the body.

‡ "There is a certain animal heat diffused through the universe, so that all things are, in a manner, full of mind; on which account, they may be quickly completed into animals, when they have received a portion of this heat. This is not fire, nor any thing like it, but a spirit which is in the semina, or elementary principles of bodies." *Aristotle de Generat. Anim.* lib. iii. c. 11. et lib. ii. c. 3.

|| The left ventricle is larger than the right, and is, as it were, gnawed. "Nam insitus a natura ignis non est in dextro."—"Mens enim hominis in sinistro ventriculo insita est, et reliquæ animæ imperat." *De Corde.*

"Et videtur sane mihi id quod calidum vocamus, immortale esse, et cuncta intelligere, et videre, et audire, et scire omnia tum præsentia tum futura."

*De Carnibus.*

"Ignis enim omnia per omnia movere potest." *De Dieta.*

Some were unwilling to admit, that Hippocrates really supposed that the soul had its seat in the breast, and imagined, that he either said so in compliance with common language, or because the great instrument of the mind (heart) resided there: But by comparing his words with the ideas of Aristotle, concerning the nature of the soul, it will appear, that he really believed the heart to be the seat of the anima, although its mental operations, or faculties, were exercised in the

was more expressly repeated by Stahl, and adopted by Mead,\* and many of the more modern physicians.

The notion of all the humours being diseased, was at last, in a great measure, overlooked, or attended to only by the bye; and the state of the blood began to be considered as almost the only immediate cause of disease. The pathology of Sydenham was founded entirely on the condition of the blood, and the operation of the *vis medicatrix naturæ*. When a contagion was introduced into the blood, then nature excited a fermentation, in order to concoct, and finally expel it. This she did, sometimes quickly, sometimes more slowly, generally by the help of a fever, terminating by looseness, or sweating. But in this, as well as in every other theory which admits the assistance of nature, we find, that the cause of the disease is most ridiculously misapplied; for they by no means prove, that the peccant matter taken into the blood, would of itself be fatal; but they most abundantly allow, that the interference of nature, which excites a dangerous disease, is often mortal, and, not unfrequently, the cause of the most lasting calamities. "What is gout, (says Syden-

ham; and also, that the anima consisted of a somewhat, which he denominated heat.

Anaxagoras, more decidedly, said, that nature was the mind or soul, "*mentem appellat.*" Galen said, that nature was a warm spirit, "*Natura item est spiritus calidus.*" Zeno, more bold, declared it to be common fire.

\* "Such is the composition of our fabric, that when any thing pernicious has got footing within the body, the governing mind gives such an impulse to those instruments of motion, the animal spirits, as to raise those commotions in the blood and humours, which may relieve the whole frame from the danger in which it is involved." *On the Small Pox.*

In pestilential fevers, "the mind hurries to the assistance of the labouring frame, fights against the enemy," &c. *Med. Precept.*

"Quis non videt in acutis pulsum vibrare vehementius, sanguinem fervere, turbari omnia? Hæc ipsa vero virtus naturæ est, quæ alienum et crudum sic potentius subigit et suis nocendi viribus exuit, vel si exuere penitus non potest, ne novas turbas moliatur, tanquam indignum arvis suis calorum variis viis intercriticæ, ut vocant, molimina expellit." *Richteri Opuscula*, tom. i. p. 313.

ham,) but a contrivance of nature to purify the blood of old men, and to purge the deep parts of the body." Few people would thank Dame Nature for this friendly purgation.

The idea of concoction, and assimilation was likewise adopted by Boerhaave, and is taught still by some modern authors. But this great physician called in the additional aid of other principles, namely, the viscosity and lentor of the blood, and the error loci of its globules. This doctrine, which will be more particularly illustrated in the theory of inflammation, had, in its principle, occurred to Asclepiades, who made disease consist in a want of proportion betwixt his atoms and the pores through which they were to pass. These doctrines of the origin and cause of disease, produced the most unhappy practice. Venesection, emetics, purges, and sudorifics, were rapidly prescribed, one after another, to avert the danger, and the urine carefully examined, to mark the progress of the concoction; whilst such remedies as tended more effectually, and directly, to check the disease, were proscribed and forbid, because they produced no sensible evacuation.

The whole of these conjectures were evidently founded upon ignorant and mistaken views of the animal economy. Unacquainted with the true laws of the living system, they reasoned upon the supposition of the blood being subject to the same changes, when circulating in the vessels of a man, as when collected and preserved in their phials and matrasses. They knew not the true history of our functions, nor the real cause of all the varied phenomena of life. Their heads were full of nothing but spirits, and humours, and ferments; and their systems were built entirely on plethora, and inanition, and cacochymy.

When, at last, they began to see more clearly the agency of the nervous system, and to abandon their belief in the co-operation of different spirits to produce the actions of life,

they found it necessary to allow, that diseases have their chief seat in the nervous system ; but being still unwilling to give up their favourite doctrine of morbid humours, they asserted, that these still existed, but operated through the medium of the nervous energy. Hoffman maintained the seat of diseases to be in "the living solid;" but avowed the agency of diseased blood. Cullen, who improved this theory, acknowledged, in many instances, the derangement of the fluids : Nor is there almost any system, even in the present day, in which it is not more or less allowed.

That medicines may, in several instances, be absorbed, and mixed with the blood, will be allowed by all ; but that they thus exert the whole of their influence, cannot be admitted ; nor will it, by any means, be considered as true, that either medicines, or contagions, act by changing the nature, or altering the properties of this fluid, until it be proved, that the blood is not circulating in vessels possessed of a power of acting on it, and until it be established, that the blood is completely an extraneous substance, subject to all the laws of foreign matter, and making no part of the living system. That in disease the blood does change, to a certain degree, is ascertained ; but these changes are not the consequence of any direct action upon it, by contagions, or medicines ; they are analogous to the alterations which take place in the rest of the system, and depend upon the same cause, namely, a general affection of the living principle. One of the most evident changes induced upon the blood, and one which might be supposed to favour the doctrine of chemical changes, being induced directly by contagion, is its conversion from venous into arterial, and from arterial into venous ; but even these changes are very far indeed from being proved to depend upon chemistry, independently of the living principle. It is considered as proved, that the venous blood is rendered arterial, by the oxygen of the at-

mosphere being combined with certain principles of the blood, and carrying these off, and that it is again rendered venous, by the addition of these substances; but it is far indeed from being proved, that these combinations, and additions, take place independently of the action of the vessels; nor is it even ascertained, that the use of respiration is to purify the blood from these substances. Had this been all which was requisite, they could have been removed by some particular excretion, as we see, in part, exemplified in the formation of the bile. The production and extrication of these substances, are, however, very much connected with the process of respiration; for, we find, that whenever the arterial blood is converted into venous, which transition takes place suddenly, certain substances are found in it; and these again are evolved, during the instant of its being changed into arterial. I formerly mentioned my supposition of the production of vitality being the main intention of the function of respiration. This principle seems to be yielded to the nerves, by the minute arteries; and, at the same instant, the blood becomes black and venous. There is then this connexion betwixt the purification of the blood from carbone and hydrogen,\* and the arterialization of it, or the furnishing of the vital principle, that both take place at the same time, and that the one process is, perhaps, instrumental in producing the other.†

The blood is to be considered as a living substance, possessed of peculiar properties, and endowed with the power

\* Some deny that hydrogen is found in the blood; but other experiments prove, that it does make a part of venous blood.

† In the fœtus, these changes on the blood took place without the assistance of the air, by the peculiar operation of the placenta, in which the blood is both freed from its carbone and hydrogen, and likewise acquires vitality, and the materials of nourishment. Some suppose, that this depends upon the fœtal blood coming in contact with the maternal in the placenta; but this is by no means proved.

of preserving its specific nature, in common with other bodies. It is only whilst it remains in this living state, that it is useful to the system ; for, if its nature be changed, it is no longer that fluid which is requisite for life. It cannot even be rendered all venous, which is the most natural and easy change which it can undergo, without immediate death being the consequence to the animal. How unphilosophical, how absurd, then, must it be, to talk of fermentations, assimilations, and putrefactions of the blood ; and how thoroughly ignorant of the animal economy must they be, who can use such language, or have recourse to those miserable explanations of the cause of disease !

From the whole of these considerations, we may reasonably conclude, that we are to look for the origin and seat of disease, not in the ideal habitation of humours and spirits, not in the chemical changes or fermentations of the blood, but in the nervous system.

Some of those who attended most to this system, attributed much to spasmodic actions ; some admitted peculiar and varied actions of the nervous system ; whilst others referred disease entirely to the different degrees of excitement, as they called it, of the living principle.

The first of these suppositions was very ably supported by Dr. Cullen, who believed, that, in many instances, the *vis medicatrix naturæ*, in order to get quit of some noxious power, formed a spasm on the extreme vessels, the consequence of which was, an increased action of the heart and arteries, in order to overcome this, and cure the disease.\* How far this theory explains the different circumstances attending inflammation, and, consequently, how far it is founded upon facts, and good reasoning, will afterwards come to be considered ; and, therefore, to prevent repetition, I shall only

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\* First Lines, &c. vol. i. chap. ii.

observe, in this place, that the Cullenian doctrine is subject to this objection, in common with others, which admit the operation of an intelligent principle in the cure of diseases; that the whole series of dangerous symptoms, or, in other words, the disease itself, is produced, not directly by the application of hurtful agents, but by the supposed interference of the healing power of nature, *quod erat absurdum*.

Mr. Hunter has given us no regular system of pathology; but, by gleaning his works, we learn, that he considers, first, that every operation of the body is an action of the living principle;\* second, that no two actions can take place at the same time, and in the same part, more than two different motions in a piece of matter;† third, that a disease is propagated from a part to the whole, by means of the sympathy which exists through the whole body, by the diffused principle of life. This principle “is, as it were, diffused through the whole solids and fluids, making a necessary constituent part of them, and forming with them a perfect whole, giving to both the power of preservation, the susceptibility of impression, and, from their construction, giving them consequent reciprocal actions. This is the matter which principally composes the brain.”‡

Upon the two first propositions I shall make no remark, because I have already endeavoured to establish and illustrate them. They are, in my opinion, the most rational foundation upon which a system of physic can be reared, and are so self-evident, that they occurred to me soon after I began to study medicine, and before I had any opportunity of knowing that they were proposed by Mr. Hunter. Upon the third proposition, I have only to repeat the remark which I formerly made, that it teaches a very confined idea of life,

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\* Hunter on the Blood, &c. p. 3.

† Ditto.

‡ Ditto, p. 89

which, according to this supposition, can only be united with a certain structure, the existence of which, in many cases, is far from being proved.

Dr. Brown attempted to simplify medicine, and reduce every disease to one of two causes.\* He began by observing, that "a certain quantity of excitability (or living principle) is allotted to every one at birth."†—"That this is acted upon by different powers, which are termed exciting powers; and their effect on the excitability is called excitement."‡—"This mutual relation obtains betwixt excitability and excitement, that the more weakly the powers have acted, or the less the stimulus has been, the more abundant the excitability becomes; the more powerful the stimulus, the excitability becomes the more exhausted."||—"In both of these circumstances, weakness takes place, which, in the first case, is called direct, in the second, indirect."\*\*—"It is the excitement alone, through its varying degrees, that produces either health, disease, or recovery."††—"The general diseases, arising from excessive excitement, are called sthenic; those that originate from a deficient excitement, asthenic. Hence there are two forms of diseases, and both are always preceded by predisposition."‡‡—"That this is the only real origin of diseases and predisposition,||| is proved, by the same powers which produce any disease or predisposition, also producing the whole set of diseases to which it belongs; and by the same remedies which cure any disease or

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\* This doctrine had, in its principle, occurred to Themison, the founder of the Methodic sect, who maintained, that diseases depended upon either an overbracing or a relaxation of the system.

† Elements of Medicine, Par. xviii. p. 7.

‡ Par. xvi. p. 5. || Par. xxiv. p. 15.

\* Par. xxxv. and xlv. †† Par. lxii. p. 50.

‡‡ Par. lxvi.

||| "Predisposition is a state intermediate betwixt perfect health and disease, The powers producing it are the same with those which produce disease." Par. lxviii. p. 59.

predisposition, also curing all the diseases and predispositions of its respective form.”\* The operation of all contagions is stimulant, and “no remedies, but those that cure diseases produced by the usual noxious powers, remove those supposed to be induced by contagion.”†—“Though the fluids may be corrupted, yet this is not a cause, but an effect of weakness. Wine, bark, &c. by strengthening the vessels, purify their contents.”‡ In the indication of cure, the only regard to be had to morbid matter, is to allow time for its passing out of the body; and that, whether it stimulates or debilitates, or gives the peculiar form to the disease, thereby adding a local to a general complaint; for, if the general disease be properly healed, the eruptions, inflammation, ulcers, will give way to the happy effects of the general cure.||

To conclude, “the whole and sole province of a physician, is not to look for morbid states and remedies, which have no existence, but to consider the deviation of excitement, from the healthy standard, in order to remove it by the proper means.”\*\*—“Such is the simplicity to which medicine is thus reduced, that when a physician comes to the bed-side of a patient, he has only three things to settle in his mind; first, whether the disease be general or local; secondly, whether it be sthenic or asthenic; third, what is its degree.”††

Upon this system I would have expected, that very little observation would have been necessary to show its absurdity; and I should have done no more than merely state it, were we not every day told of the progress which it is making. One great and leading error, which every one will observe, is, that he supposes the more life or excitability that any person has, the nearer he is to death.‡‡ Here the dependence

\* Par. lxvii. p. 51.

† Par. cxviii.

\*\* Par. cxlix. p. 133.

† Par. xxi. p. 10.

|| Par. xcvi. p. 81.

†† Par. lxxix. p. 61.

‡‡ Par. xxiv.

of energy for its production, upon the continuance of natural action, is overlooked. When the action is too little, energy is not produced; when the action is too great, or in a morbid degree, its production is not only injured, but more is expended than can be generated. These are the effects produced by a deficiency or increase of action, to a morbid degree. There can be no accumulation of life, or, were it to take place, as from want of food, for instance, then it follows, that any stimulus given before death, should preserve life; and the living power being very abundant, the person ought easily to bear a strong stimulus, which is far from being the case.

This, however, is a very trifling mistake, when compared to the next error, which teaches, that all diseases consist entirely in different degrees of excitement of this life, and not in any new and peculiar operation or action which it performs. Do not all the phenomena of fevers, small-pox, syphilis, and almost every disease, controvert this doctrine in the strongest manner? Will every stimulant cure the venereal inflammation? Will wine cut short the progress of a fever? Is it debility alone that is to be regarded in the treatment of a fever, and stimulants alone that are to be administered? \* I will venture to affirm, that if this practice be followed out, no man can estimate the lives which shall be lost. If debility alone produces fevers, I will demand of the Brownian, why, in the course of a few hours, the pulse falls from its great frequency almost to the natural standard, and that without any stimulant being exhibited, or the patient feeling, in the least degree, stronger, or being able to make one greater exertion? I shudder when I recollect the scenes which I have witnessed, and the miserable effects of the blind Brownian practice. Wine and opium, I do most

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\* Par. delxxx.

sincerely believe, are, in the hands of Brown's disciples, what fire and sword are in the battles of the cruel.

From the apparent simplicity of this theory, the student is led to neglect the various operations of the system, and disregard the nicer symptoms and distinctions in diseases, being taught, that his sole province is to inquire into the degree of excitement, that he may bleed in one case, and give wine in another. And, to remove any scruples which may still remain in his mind, concerning the radical differences of diseases, he is assured, in the strongest manner, that in no respect are they different, except in the circumstances of strength or weakness; that there are no specific operations of the living system, no alterations even in the fluids, (which were to the humouralist what the nervous system ought to be to the true physiologist,) modifying the disease; and that, therefore, he need not, on this account, think of varying his treatment; for all eruptions and conditions, thus induced, will yield to the sthenic or asthenic plan.

From this leading error in the system, it is astonishing how little able many Brownonians are to distinguish betwixt two dissimilar diseases, which have some general symptoms in common. This, it may be said, ought to be placed to the account of the stupidity of the physician; but, certainly, the doctrines which this system teach, are well calculated to increase that natural stupidity, by giving little incentive to investigation.

Of late, this theory has been modified, by the introduction of chemical principles, many diseases being attributed to an increase, or deficiency, of oxygen, as well as a deviation from the due state of excitement. Whether oxygen be, or be not present, in greater and less quantities, at different times, is a point which I shall not inquire into; but I think it is pretty evident, that if, in any disease, there be too much, or too little, of any chemical principle present, or employed

in the whole system, or a part of it, the mere addition or subtraction of part of that principle will not inevitably cure the disease, because we do not thus alter the action which constitutes the disease; and this redundancy, or deficiency, is a symptom, and not a cause. We never can prevent the introduction of what may be called the chemical elements into the body by any means whatever. They are all essential to our existence, and the modification which they receive will continue as long as the action exists which regulates or produces it, whatever chemical or mechanical contrivances we may fall upon to prevent it. If phthisis depended upon the presence of too much oxygen in the blood, which is not proved, we could not cure it by breathing an impure air, because the oxygen which the atmosphere did contain would be more completely consumed; and if we gave less than the quantity necessary, respiration would cease to be properly performed, just as it would in health be injured by a proportionate diminution. It is likewise a very mistaken notion, that because hydrocarbonate, and other airs, mixed with that which we breathe, give relief sometimes, therefore a diminished quantity of oxygen is useful. They forget that these airs are very powerful medicines, and act independently of their mechanically lessening the quantity of oxygen, by occupying its place. The proper argument would be, to prove, that the poor, in their low, ill aired habitations, live longer in consumption than the rich, which few will believe. It is likewise conjectured, that, by adding the chemical principle in superabundance, we induce the disease or condition, which is supposed to depend upon the presence of this; as, for instance, it is supposed that too much oxygen will produce phthisis; if so, the purest air ought to be most unhealthy, and those who live in the country, and on mountains, ought to be most subject to consumption. So sanguine is one gentleman in his belief of this doctrine, that he hopes, chemi-

cally, to suspend the laws of nature, and make the trees distil butter and cream. This would be a valuable discovery for the Hindoos; for, by a similar process, they might procure beef and mutton, without taking existence from an animated being. I know only one story which can match this, and indeed the whole theory, and that is, the old tale of a town, where roasted pigs run through the streets with knives and forks stuck in their posteriors, crying, Come eat us! Come eat us!

The last theory which I shall take notice of, is that of the very ingenious Dr. Darwin; which, in one respect, is similar to the Brownian doctrines, but differs in the particular steps, leading to the general principles.

To examine this theory fully, would, on account of its complexity, require more time than is compatible with my present purpose. I can, therefore, only give here the outlines, and most fundamental parts of the doctrine.

“The whole of nature\* (according to Dr. Darwin) may be supposed to consist of two essences, or substances, one of which may be termed spirit, and the other matter. The former of these possesses the power to commence, or produce motion, and the latter to receive and communicate it. So that motion, considered as a cause, immediately precedes every effect; and, considered as an effect, it immediately succeeds every cause.”—“The motion of matter may be divided into two kinds, primary and secondary. The secondary motions, are those which are given to, or received from other matter in motion.”—“The primary motions of matter may be divided into three classes; those belonging to gravitation, to chemistry, and to life; and each class has its peculiar laws.”—“This last class of motion is the subject of the following pages.” Motion, which is defined “to be

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\* *Zoonomia*, vol. i. p. 5.

a variation of figure,"\* is divided, in the animal body, into two classes :

First, Sensorial motions, or those peculiar to the sensorium, which constitute the sensation of pleasure and pain, and which constitute volition, and cause the fibrous contractions, in consequence of irritation, or association. These motions are not fluctuations of the spirit of animation, nor vibrations, nor equilibrations, but changes, or motions of it, peculiar to life.† They are the faculties, or motions of the sensorium, to be afterwards mentioned.

Second, Fibrous motions, which include the motions of the muscles, and organs of sense,‡ which are contractile, and which, by their various configurations, give us ideas.

The spirit of animation is the immediate cause of the contraction of animal fibres. It resides in the brain and nerves, and is liable to general and partial diminution, or accumulation. It is also called the sensorial power.||

The stimulus of external bodies is the remote cause of this contraction.

A certain quantity of stimulus produces irritation, which is an exertion of the spirit of animation, exciting the fibres into contraction.

A certain quantity of contraction of animal fibres, if it be perceived at all, produces pleasure ; a greater, or less quantity of contraction, if it be perceived at all, produces pain. These constitute sensation.

A certain quantity of sensation produces desire, or aversion. These constitute volition.

All animal motions, which have occurred at the same time, or in immediate succession, become so connected, that, when

\* Zoonomia, vol. i. p. 1.

† Ditto, p. 35.

‡ Ditto.

|| Ditto, p. 50.

one of them is reproduced, the other has a tendency to accompany or succeed it. When fibrous contractions succeed or accompany other fibrous contractions, the connexion is termed association: When fibrous contraction succeeds sensorial motions, the connexion is termed causation: When fibrous and sensorial motions reciprocally introduce each other, it is termed catenation of animal motion. All these connexions are said to be produced by habit, that is, by frequent repetition.\*

The spirit of animation acts in four different ways, or “possesses four different faculties;”† and the contraction of all the fibrous parts of the body depends upon the exertion of these powers. The property, or capability, of causing fibrous contractions, in consequence of the irritation of external bodies, is called irritability, and the effect irritation; which is defined to be an exertion, or change of some extreme part of the sensorium, residing in the muscles or organs of sense, in consequence of the appulses of external bodies.

The faculty of causing fibrous contractions, in consequence of the sensations of pleasure and pain, is termed sensibility, and the effect sensation; which is an exertion, or change of the central parts of the sensorium, or of the whole of it, beginning at some of those extreme parts of it which reside in the muscles or organs of sense.

The power of causing fibrous contractions, in consequence of volition, is called voluntariness, and its effect volition; which is an exertion, or change of the central parts of the sensorium, or of the whole of it, terminating in some of these extreme parts of it, which reside in the muscles or organs of sense.

\* *Zoonomia*, vol. i. p. 31.

† *P.* 32.

The capability of causing fibrous contractions, in consequence of the association of fibrous contractions with other fibrous contractions, is termed associability, and the effect association ; which is an exertion, or change of some extreme part of the sensorium, residing in the muscles or organs of sense, in consequence of some antecedent, or attendant fibrous contraction.

As these faculties, at the time of their exertion, may be termed motions (for we cannot pass from a state of insensibility or inaction to a state of sensibility or exertion, without some change in the sensorium, and every change includes motion,) they may be called sensorial motions.

The fibrous motions of the animal, then, are of four different kinds, irritative, sensitive, voluntary, and associate.

In every contraction of a fibre, there is an expenditure of the sensorial power, or spirit of animation ; and, when the exertion of this sensorial power has been for some time increased, and the muscles, or organs of sense, have, in consequence, acted with greater energy, there is an exhaustion of the quantity of power : On the contrary, when there has been less exertion, it becomes accumulated in the inactive part.\*

Strength is the consequence of the presence of a great quantity of stimulus and sensorial power ; for the quantity of motion produced in any particular part of the animal system, will be as the quantity of stimulus, and the quantity of sensorial power, residing in contracting fibres.

If the quantity of sensorial power remain the same, but the quantity of stimulus be lessened, then *debility from defect of stimulus*, or direct debility, of Dr. Brown, is produced ; in which case the contractions are feebler, and often retrograde.

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\* Zoonomia, vol. i. p. 72.

If the quantity of stimulus remain the same, but the quantity of sensorial power be lessened, then *debility from defect of sensorial power*, is produced, or indirect debility.\*

Disease is the consequence of any deviation of these motions from the healthy state ; and, therefore, are divided into diseases of irritation, sensation, volition, and association ;† for an account of which, as well as of the minuter parts and illustrations of the theory, I must refer to the work itself.

In examining the truth of this theory, it is proper, first, to consider, how far the doctrine of simple motions will explain the phenomena of life ; and, second, how far their derangement will account for the different diseases. It would be endless to follow the application of this theory through the whole animal economy. I shall deem it sufficient to attend only to one or two functions, particularly digestion and secretion.

The whole system, says Dr. Darwin, consists of extremities of nerves ; and all the filaments either do possess, or once possessed, the power of contraction.‡ By the motion of these fibres, are all the operations of the living system, and all its functions, immediately performed. Now, these motions can only consist either in contraction or dilatation, in various directions. This, I apprehend, must be admitted ; and no other kind of motion is proposed by Dr. Darwin, except sensorial motions, which give pleasure and pain. The operation of sensation, or the sensorial motions, is indeed very fully admitted in this theory, and supposed to regulate many of the functions ;|| but still these must, in the end,

\* *Zoonomia*, vol. i. p. 75.

† P. 361. et seq.

‡ *Zoonomia*, vol. i. p. 463.

|| “ If the food which we swallow is not attended with an agreeable sensation, it digests less perfectly ; and, if a very disagreeable sensation accompanies it, such as a nauseous idea, or very disgusting taste, the digestion becomes impeded,

operate upon the fibrous contraction, which I can conceive only to admit of two states, namely, relaxation and contraction. Now, these never can explain the varied phenomena of life, and all its intricate and peculiar actions ; neither can it possibly account for the diseases to which we are subject, even although we admit of all the complications of motion which Dr. Darwin supposes to exist.

If I have succeeded in establishing the doctrine of varied and constant actions, in the living system, then Dr. Darwin's theory, of the effects of simple motions, is necessarily unfounded ; and if the effects of actions upon the body, depend not altogether upon their quantity or degree, but also upon their species, or similarity or dissimilarity to the natural action, then the supposition made by Dr. Darwin and Dr. Brown, that the expenditure of power or weakness, is proportioned exactly to the quantity of exertion, motion, or excitement, is unfounded ; and if the doctrine, of the production of energy being dependent upon the due presence of action, be admitted, the supposition of the accumulation of excitability, or spirit of animation, must likewise be unsupported.

Before quitting this subject, I shall, for the satisfaction of the reader, take notice of the explanation which is given of fever.\*

or retrograde motions of the stomach and œsophagus, succeed, and the food is ejected." *Zoonomia*, vol. i. p. 390.—" Every kind of gland must possess a peculiar kind of irritability, and, probably, sensibility, at the early state of its existence, and must be furnished with a nerve of sense, or of motion, to perceive, and to select, and to combine, the particles which compose the fluid it secretes." P. 516. "It would seem, that all the glands in the body have their secreted fluids affected, in quantity and quality, by the pleasurable or painful sensations, which produce or accompany those secretions ; and that the pleasurable sensations, arising from these secretions, may constitute the unnamed pleasure of existence, which is contrary to what is meant by *tedium vitæ*, or *ennui*." P. 518.

\* *Zoonomia*, vol. i. p. 380. et seq.

When, by the application of cold, inanition, fear, &c. a torpor, or quiescence, of any considerable part of the circle of irritative motions, is induced, the whole class of them is more or less disturbed, by their irritative associations ; or, in other words, if any such debilitating cause be applied to a part, the rest quickly sympathises, and becomes weakened. From the quiescence of the particular organs concerned in producing the various functions, we have diminution of these functions, sickness, vomiting, paleness, coldness, weak and small pulse, &c.

But, “as soon as this general quiescence ceases, either by a diminution of its cause, or by the accumulation of sensorial power, which is the natural consequence of previous quiescence, the hot fit commences.” Every gland is now stimulated into stronger action than is natural ; there is a superabundance of all the secretions, and, in consequence of this, an increase of heat ; the skin becomes red, and the perspiration great ; but, as the absorption is still great, the sweat is not perceived, until, in the decline of the hot fit, the mouths of the absorbents of the skin are exposed to the cooler air, or bed-clothes, by which they lose their increased activity, and cease to absorb more than is natural ; but the discerning vessels act for some time longer, being kept warm by the circulating blood ; and, therefore, we have a sweating stage.

When the contractile sides of the heart and arteries perform a greater number of pulsations, in a given time, and move through a greater area at each pulsation, whether these motions be produced by the acrimony or quantity of the blood, or by association with other irritative motions, or increased sensorial power, or by any stimulus, we have synocha, or irritative fever, with strong pulse.\* When, again, the contractile sides of the heart and arteries perform a greater

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\* Zoonomia, vol. i. p. 361.

number of pulsations, in a given time, but move through a less area at each pulsation, from defect of stimulus, or of sensorial power, we have typhus mitior, (or nervous fever,) or irritative fever, with weak pulse.\* Besides these feeble motions, induced by irritation, it frequently happens, that pain is excited by the violence of the fibrous contractions, and other new motions are superadded, in consequence of sensation. This, which occasions inflammation, gives a different form to the fever, which is called sensitive,† and, like the irritative fever, will naturally be of two kinds, having the strong and weak pulse; the first is called inflammatory fever, the second, typhus gravior. This is farther explained, by observing, that, when the motions of any part of the system, in consequence of previous torpor, are performed with more energy than in the irritative fever, (or than is compatible with the existence of simple irritative fever,) a disagreeable sensation is produced, and new actions, of some part of the system, commence, in consequence of this sensation, conjointly with the irritation; which motions constitute inflammation; and, according as this has taken place, in one or other of the species of irritative fever, so shall we have either inflammatory or putrid fever.‡

Upon this subject, I shall only remark, that the general account of the production of the symptoms of fever, is not satisfactory, and that the causes assigned will not produce the effect, as will, I presume, sufficiently appear, from what has been already said in this dissertation. Cold, applied to the system, may sometimes produce fever; but, upon this supposition, it ought uniformly to do so, which is not the case; and farther, every debilitating cause, as venesection, poor diet, want of food, &c. ought always to be followed by

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\* Zoonomia, vol. i. p. 362.

† Ditto, p. 391.

‡ Ditto, p. 412.

paroxysms of fever, in consequence of the quiescence which they induce. There is, likewise, no proof, that sensation affects the nature of a fever, and produces local inflammation; but there is very abundant evidence, that peculiar agents, acting on the living system, may induce fever, and modify the action, to an almost endless degree, producing the whole tribe of febrile diseases.

### *Summary of the Laws of Action.*

Having made these observations upon the different systems of pathology, and having, in the course of this dissertation, endeavoured to establish the necessity of attending to the actions of the living system, and of ascribing to them the phenomena of health and disease, instead of indulging in speculations concerning the fluids, or their changes, or about simple excitement, or motions of the system, I shall now conclude this part of my subject, with a short summary and illustration of the doctrine. For which purpose, I observe,

First. That the nervous energy, unacted on, can exhibit no phenomena, nor perform any operations.

Second. Arterial blood seems to be the natural and indispensable stimulus to this nervous system, or agent, enabling the energy to perform its operations. It is likewise the source of renewal to this energy.

Third. In a state of health, there is a particular action present in the system, upon which that state depends. This may, therefore, be called the natural action, and consists, collectively, of all the operations or phenomena necessary for the existence of the animal.

Fourth. This action is an operation of the nervous energy, which is, therefore, employed and expended in its performance; on which account, there must be a regular renewal of

power; and this renewal is dependent upon the proper action of the nerves.\*

Fifth. All external agents, or foreign bodies, capable of operating on the body, must induce an action, more or less different from the natural one; or, in other words, will change the action of the system to a greater or less degree. As it is certain, that no two actions can be separately performed by the same part at once, more than the tongue can articulate two languages at the same moment,† it follows, that the new action, thus induced by foreign agents, must be a complication of the new action with the natural one; or, to speak more properly, the natural action becomes modified by the new stimulus; and the more that this action is changed, or becomes diseased, the more must the part suffer. From observation fourth, it will appear, that the production of energy must be thus injured; and it will be at once evident, that if health and strength consists in the due existence and performance of the natural action, if this action be changed, weakness and disease must be the consequence; and, likewise, that these diseases are most dangerous in which the action is greatly changed; whereas, in these in which it is less altered, the danger is less, and they may subsist longer without producing death.

Sixth. It is necessary, that every new agent, or stimulus, should have a certain degree of strength; or, in other words,

\*In some diseases, we find, that the nerves do not take from the blood as much life as it is capable of yielding. In this case, the blood in the veins is redder than usual, and, when drawn, coagulates, almost totally, into a mass, containing, like the coagulum of arterial blood, the greatest quantity of the serum, blended with the other principles. In many diseases, proceeding from derangement of the stomach and bowels, and in approaching syncope, this fact may be observed.

† Although no two actions can exist separately in the same place, and at the same time, yet they may sometimes become blended, producing an action different from either. Some actions, however, cannot be thus blended, but the one will either displace the other, or will not take place at all.

possess a certain quantity of the peculiar power by which it operates, in order to act upon the living system ; because the natural action, if I may use the expression, keeps its ground, with a certain degree of tenacity, and will only yield to a certain force. For example, a grain of ipecacuanha, a drachm of glauher salt, a drop of laudanum, or contagious matter, much diluted, will produce no effect upon a man. Were this not the case, we never should enjoy health ; because the small quantity of contagious matter, which we may suppose to be often contained in the air, should uniformly affect us. The less energy that a person has, the weaker is the natural action ; and, the weaker that the natural action is, the easier is it changed, or destroyed. Hence, the child is more easily injured than the adult ; and he who is reduced by fatigue, abstinence, or previous disease, than the healthy and robust man. This law likewise obtains, with regard to the actions of sense, as every one knows who has attended to the phenomena of seeing, hearing, tasting, &c.

Seventh. Certain agents, which may have strength enough (by which I mean capability) to change the natural action, will not be sufficient to affect it, if it has already been modified by the previous application of a different agent. It is on this account that contagions often fail, at particular times, to produce their effect : Because the presence of some other agent has previously modified the action, more or less ; and, until the effects of this be gone off, no new disease takes place, unless the new stimulus be very dissimilar indeed to that which induced it. We have an instance of the one case, in small-pox not displacing measles ; of the second, in mercury destroying the venereal action.

Eighth. The agent in general operates most on the part to which it is immediately applied, if that part be susceptible of its operation, and in a less degree upon neighbouring parts. The degree, however, to which these agents may extend

their action, is very various. Some, for instance, when taken into the stomach, extend their action over the whole system, whilst others act only upon the stomach itself, and produce no effect on the rest of the body, except such as take place in consequence of the sympathy of equilibrium. When heat is applied to a part, it inflames that part, but acts likewise, in a less degree, on those which are near it; so that if one spot, to which most heat was applied, mortifies, or forms an eschar, those near it shall only exhibit a moderate degree of inflammation. Cantharides likewise extend their action beyond the spot to which they are applied, but in a much less degree than heat. Contagions, however, producing specific inflammation, are more confined in their operation than simple inflaming causes. Specific inflammation generally terminates more abruptly; that is to say, it does not diffuse itself so far as simple inflammation; but sometimes it is surrounded by simple inflammation. Thus the variolous inflammation is surrounded by a simple erysipelatous inflammation.

Ninth. The impressing cause, or stimulus, must not only be of a certain strength, but it must also be applied for a certain length of time before it can produce its effect. That some time is necessary for the formation of an action is evident; because, setting all other reasons aside, we observe a certain interval betwixt the first derangement of the natural action and the appearance of the new action, in its full and proper state. This period of formation is always marked by symptoms of weakness, such as lassitude and chilliness; and the effects of impaired functions, such as anorexia, thirst, and head-ache, even although the action, when fully formed, should be such as to require bleeding, and what are called sedatives, as we see illustrated by the history of inflammation. These symptoms do not precede those actions alone which are called diseased; for we find similar effects pro-

duced during the formation of those actions which are afterwards to become permanent and natural. Thus the child during dentition, the young animal during the shooting forth of his horns, the peacock when he gets his crest, and the turkey when the fleshy excrescences on the head are formed, have all a diminution and affection of the natural action, producing disorder of the system, and sometimes even death itself. The time which is required for the formation of these actions is various; nor can the exact duration, in every instance, be easily ascertained. It may, however, be observed, in general, that the more dissimilar the new action is to the old or natural one, and, consequently, the more dangerous that it is, the sooner is it formed;\* but as many causes (particularly the previous existence of other actions, or modifications of the natural action, although so slight as not to be much attended to) may tend to interrupt and postpone the establishment of the action, the period of formation in the same action may be different at different times. And, farther, as the constitution or natural action of no two people are exactly alike, the time of formation will vary in different people; and, in some, particular actions may never, or very seldom take place, although they be fully exposed to the exciting cause.†

But besides this time which elapses during the formation of an action before it fully appears, there is likewise an interval betwixt the application of the cause and the commencement of the formation; but this is much less in some diseases than in others. It is natural, however, to suppose, that this interval bears some proportion to the quickness of the formation. The contagion of very bad typhus fevers,

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\* The fevers, vulgarly called putrid, that is, very bad fevers, come on with a shorter cold fit than those which are milder. The position is likewise illustrated by many other diseases.

† Some people are much less subject to fevers, to syphilis, &c. than others; and some never take the small-pox.

for instance, operates much sooner than that of the common nervous fever, as it is called.

A knowledge of the different times required, by certain agents, to produce these effects, is of no small importance, because we may thus be able to escape their action, in many cases. By washing off some contagions shortly after their application, we prevent the disease, as we see illustrated by syphilis. In cases where poisons are taken into the stomach, we can prescribe an emetic, which operates more quickly, and thus removes them; and for this purpose, we employ white vitriol rather than emetic tartar, because the one acts more speedily than the other.

Tenth. The same stimulus will always produce actions radically the same; but varying the degree of stimulus will often so affect the action, as to make it apparently different. Thus, heat, in a small degree, makes the natural action be carried on more perfectly, and gives pleasure; but, in a greater degree, it increases the action so much, as to change its appearance, or visible effects and symptoms, producing inflammation, which, from analysis, we learn to be an increase of the natural action.

Eleventh. The action remains for some time after the agent is withdrawn. If this were not the case, we should always be able to cure a disease, by removing the exciting cause, which no one expects to be able to do. Removing a blistering plaster, for instance, will not immediately remove the inflammation which it has produced. There is, however, no certain rule for the duration of these actions; because one continues much longer than another; and some seem even to have no tendency to decrease or disappear after any duration, however long.\*

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\* It is impossible, in the present state of our knowledge, to ascertain the immediate cause of this. We cannot, for instance, say why the variolous inflammation subsides spontaneously in a few days, whilst the venereal action remain

Twelfth. All actions affect one part of the body more than the rest. Sometimes there is only one organ affected, producing a disease entirely local ; at other times, the whole system suffers ; but, in this case, there is always one part in which the action chiefly exists.

All morbid actions, which are extended over the system, affect the circulation, and produce frequency of pulse ; and, when fully formed, heat of the skin. These, when concentrated in any part, or when they affect any organ to a great degree, produce a species of inflammation ; and it is easy, from the connexion of the inflammatory action with the state of the vessels, to see how this should take place. If the action exists to less degree than this in the part, then it does not produce inflammation, but only pain, and a state bordering on inflammation.

Thirteenth. When specific inflammation is induced in any part, the susceptibility of the neighbouring parts, for assuming this, is lessened ; and they seldom do assume it, unless some stimulant be applied to them. Thus, a certain number of pustules are produced in small-pox, by which the rest of the surface is less subject to the variolous inflammation. If, however, other stimulants be applied, such as heat, then, notwithstanding the diminished susceptibility, the inflammation is excited, and a great eruption is produced.

Fourteenth. Those agents which induce actions nearly similar to the natural one, or which change its nature little, at least comparatively speaking, may be called *agentes similes* : These, which have also been named stimulants, uniformly produce weakness, after their operation is over, unless it subside very slowly, and thus allow the natural action gradually to regain its perfection before their artificial action disap-

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unabated through life ; neither can we tell why the action induced by opium subsides in a few hours, whilst that of typhus continues for days ; why some actions disappear and return alternately, for a length of time, and others remain constantly the same.

pears, and, consequently, before the system can be reduced to an inactive condition, as we see in the effects of great and sudden muscular exertions, which weaken more than a long continued, but gentler action, though this, in the sum, be greater than the other.

As these actions resemble, in some degree, the natural action, they also, in some degree, supply its place ; and we often do not so readily, during their continuance, perceive the weakness which they induce ; but, at other times, we can readily detect its existence, at least in particular functions. Thus, for instance, the presence of inflammation uniformly impairs the function of the inflamed part, as we see in the case of muscular motion, which is diminished in rheumatism ; for, independent of the pain, we could not make the same exertion as formerly ; and, in synocha, we cannot walk, nor eat, nor do what we used to do. If, however, the action be still more nearly resembling the natural action ; or, if the nature of the healthy action be still less changed, then we do not perceive the weakness as long as it continues, as we see in the case of the vinous action ; on the contrary, the person can make a greater exertion during it, because it differs very little from the natural action.\*

When the action of any part is much increased, its power is expended ; and, therefore, in order to prevent farther weakness, after the operation of the stimulant is over, we find, that the action of the system is diminished in proportion to the diminished power, and both are only slowly increased or renewed. This fact is overlooked by the Brown-

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\* According to the Brownian doctrine, stimulant actions should not produce weakness until their operation be over. But experience proves, that the reverse is the case ; and I have endeavoured to show why it does not appear in every period of an action, and in which actions we are to expect it. We do not observe it in the vinous action, if it exist only in a slight degree ; but if it be greater, it becomes evident. We observe it uniformly in inflammatory diseases, and, indeed, during the continuance of every stimulant action, if it be induced to a considerable degree.

onians, who give stimulants in this case, as they say, to increase the excitement. But this practice is evidently improper, in most cases ; and, where it is admissible, the quantity of stimulus must be very small, and must be of such a kind as tends to excite the natural action of the part ; as, for instance, soups for the stomach, &c.

The more quickly that the stimulant action is induced, and the greater its degree, the more quickly does the weakness appear, and the greater is it. This evidently must be the case ; because action requires power or energy,\* and the more quickly that it is raised, the less able is the nerve to supply this energy.† When a part is scalded with water, there is a very great action instantaneously induced ; and, therefore, there is a weakness of the part very quickly induced ; and the inflammation requires the application of gentle stimulants for its cure, as will be afterwards mentioned. If the degree of heat has been still greater, then immediate death, or mortification of the part, takes place, and an eschar is formed.

From these remarks, it is evident, then, that increased action, in consequence of the application of stimulants producing diseases, as well as an increased exercise of particular functions, will produce weakness, which will be sensibly perceived, unless the stimulant action very nearly resembles the natural one, and subsides very gradually. The vinous action, unless it has been moderate, and, consequently, lessens gradually, produces weakness ; muscular exertion fatigues ; too much food taken into the stomach weakens it, and vomiting, or temporary dyspepsia, take place ; heat overpowers the system, and causes fainting.

\* It is easy, from this, to see how weakened parts should bear disease worse than the strong.

† One cause of this, amongst many others, is, that the more abrupt the transition is, from one state to another, the more is the function injured.

Fifteenth. Those agents which induce actions very dissimilar to the natural action, may be called dissimiles, and produce great weakness very quickly; whereas, in many instances of stimulant actions, when they do not arise to a great degree, the sensible weakness is not perceived for a considerable time, and until the stimulant action has subsided.

The agentes dissimiles, or what have been improperly called sedatives, may, like the agentes similes, or stimulants, induce very violent actions, and will often require the use of such remedies as tend to abate action in general; such as cold and blood-letting. These actions are always attended with an inflammatory affection, when they exist, in a great degree, in any organ: That typhus is always attended with an inflammatory affection of the head, and sometimes of the lungs, or abdominal viscera, must be acknowledged by every one, who is conversant in dissection: that the plague and yellow fever are attended with inflammation, is equally certain: that lead induces inflammation, is so well known, that bleeding is frequently used, with success, in the cholic which it produces: laurel water produces an inflammatory or hæmorrhagic action of the brain, marked frequently by delirium, red eyes, and turgidity of the vessels. It must, therefore, appear, that the medicines, called sedatives, have no title to that appellation, which belongs only to such agents as tend to abate action in general; and, therefore, can only be properly applied to venesection, and cold, and abstinence, which, under certain circumstances, abate action, not indeed by any positive power, or peculiar quality, but negatively, by removing causes, which keep up action.

Notwithstanding the utility of bleeding, in the beginning of many actions belonging to this class, it yet must be remembered, that the practice is hurtful, if employed too late, and after any very considerable weakness is induced, by the continuance of the dissimilar action: opposite remedies will then be of use.

The actions belonging to this class are by much the most dangerous, as will appear from one or two examples.

When a person is bit by a serpent, we invariably find very great weakness produced, with more or less rapidity. The countenance becomes pale, a tremor seizes the whole body, the breathing becomes hurried and oppressed, and the pulse weak and irregular : convulsions close the scene. These are the general effects of the bite of venomous animals ; but we find different modifications taking place, according to the specific difference of the poison. The bite of some serpents is fatal in less than an hour, whilst that of others does not kill for a much longer time. Some produce violent convulsions, others a stupor ; some cause excruciating pain, whilst others kill with an easy insensibility.

The poison generated by rabid animals, is likewise a very powerful agent dissimilis, producing great languor and dejection, and weakness of all the functions, attended with spasmodic affections of the muscles, and particularly of those of the throat, which become convulsed, from very slight causes.

The dissimilar agent, however, which we most frequently meet with, is the contagion of typhus fever, concerning the nature and operation of which there have been many disputes. Some have considered the putrefaction of animal and vegetable matters as the cause producing contagion ; others have referred it to an unknown state of the air ; others, to certain alterations in the atmosphere, which might be ascertained and imitated by chemical processes ; whilst some have denied altogether the existence of typhus contagion. There have been still more disputes about the nature of the disease, which this contagion induced. Some called it the effect of fermentation ; others, of spasm ; others, of pure weakness ; but the wisest part of physicians allow it to be a peculiar action, which they cannot imitate or produce, by any of those general causes.

As all these agents produce great weakness, it might be supposed, that the cure ought to consist entirely in prescribing, from the very first, such medicines as would tend to produce an action as nearly similar to the natural one as possible ; such as wine, or other fermented liquors. But it is to be remembered, that, in the first place, those actions will not, in the beginning, yield to the natural one : they have already destroyed it ; and, therefore, it is not to be expected, that such agents, as tend only to excite an action somewhat similar to the natural one, should be capable of displacing these.

There is, however, a still more serious objection to this practice: the proposal is made, without attending to the circumstance of, what are called, sedative actions, being, in their commencement, sometimes so violent,\* as to require the application of such causes as tend, in general, to abate all actions indiscriminately ; such as bleeding, and the use of cold, to a moderate degree. It is likewise to be observed, that as wine cannot displace the typhus action at first, it will, by its operation, tend to increase it ; and as both the contagion and the wine act more upon the head than on other parts, in proportion to their size, it will readily be seen, why the early use of wine, in fevers, so frequently produces phrenitis ; for it has been already mentioned, that whenever any action was much increased, or concentrated in a particular part, it induced a species of inflammation. Wine, however, is useful, after the first stage of the disease is over, and the more immediate violence of the action has subsided, and the weakness is making progress against us. In this case, it is as useful, as it formerly was hurtful.

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\* There is, in the beginning of these actions, a state somewhat approaching to the condition in inflammation ; and this state, of violent or increased action, continues longer or shorter, in different sedative actions. In some, it lasts only a few hours, and these are the most dangerous.

Sixteenth. Removing the sensible effects of any particular action, has a tendency to destroy the action itself. Thus, such applications as abate the pain of the head, in typhus fever, tend to abate the fever; such as abate the heat in inflammation or fever, abate these diseases. This is called practising according to symptoms, and is a method, at all times, to be followed, even in the cure of those actions or diseases, for which we possess specific remedies, as the operation of those remedies will be greatly assisted by it.

Seventeenth. Diseases are often cured also, by removing the particular state of the system, which gives to them their peculiar inveteracy or danger.\* Thus, inflammation of weakened parts is removed, by strengthening the part; that is to say, increasing its energy; which we do, by such remedies as act on the whole system, at the same time that we apply such agents to the part itself, as shall tend to change the action. It may be thought, that increasing the action of the system, in this species of inflammation, should be prejudicial, and should increase the inflammatory action; because this was perhaps originally produced by the communication of action from the neighbouring parts: but the remedies which we employ, tend not to induce an inflammatory action in those parts, but one more nearly resembling the natural action, and thus augment the energy, and diminish the inflammation. If, however, the inflammation has happened from a morbid increase of action, in a part already strong, then such remedies as tend to increase this shall do harm.

Eighteenth. Actions which are suddenly induced, in healthy parts, are more dangerous than those which are excited more gradually; or, in other words, the more speedy the transition is, from health to disease, the more does the animal suf-

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\* Disease is often so connected with the state of the system in which it occurs, that removing that state of the system, shall remove the disease.

fer. It is, for instance, observed, that people bear amputation better, if it be performed on account of some disease of long standing, than if we operate on account of some sudden accident; one cause of which is, that the constitution had formerly been accustomed to a diseased state, or inflammatory action; and, therefore, suffers less by the one which our operation induces.

Nineteenth. The more the system, at the time of the application of any new agent, approaches to the general condition which that agent tends to induce, the more dangerous will the action of the agent be, and the more readily will it operate. Thus, typhus fever tends to produce great weakness, and, therefore, will be more dangerous when it attacks those who have been formerly much reduced than those who have not. Those, again, who are very vigorous, may be said, as Mr. Hunter observes, to have their action as high as it can be without disease being induced; very trifling causes may, therefore, operate on them. Inflammation will be very high in them; and wounds, or accidents, extremely dangerous. They will even be more easily acted on by the agentes dissimiles, or sedatives, as they have been called, than those whose action is less, and nearer the proper medium, because they are more easily rendered diseased, and the inflammatory state which these agents tend to excite will be more violent in them.

Twentieth. Contiguous parts sympathise with each other to a certain degree. Hence, if the action of any part be increased, the increase spreads in a less degree to the neighbouring parts, unless these parts exhibit the sympathy of equilibrium; such as the skin and liver, for instance. Hence also, if a part be weakened by cold, the action of the neighbouring parts spreads to it after the cold is withdrawn, and communicates to it a greater degree of action than its weakened state can bear; the consequence of which is inflammation, which

ends frequently in gangrene. Upon the same principle, a part draws support from the contiguous parts, and bears disease much longer, on this account, than it otherwise would do. Hence, when causes act locally on a part, in such a way as to kill it, the neighbouring parts are weakened ; or, if it be a large part which is affected, the whole system is injured.

Twenty-first. When an increased action is induced in one part, it has a tendency either to diminish action in some other part, or to increase it for a time in that part, according to circumstances, which have been already explained in treating of the sympathy of association, and the sympathy of equilibrium. Contiguous parts, of a similar structure, most frequently exhibit the sympathy of association, and the action spreads more rapidly in them ; contiguous parts, of dissimilar structure, exhibit, in the same circumstances, most frequently, the sympathy of equilibrium. It is evident, therefore, why all local actions extend themselves farthest, and most quickly in those parts which are similar to the spot in which they commenced. Hence, as Mr. Hunter has observed, when one portion of a gland becomes inflamed, the rest also becomes quickly inflamed ; but the surrounding cellular substance, or skin, is much longer of becoming affected. Hence, also, we may sometimes check the progress of some cutaneous actions, by applying caustic round the diseased spot, so as to enclose it as with a ring ; for the morbid action does not extend itself deeper than the skin, and it does not overleap the destroyed or altered substance produced by the caustic ; it is therefore checked.

Twenty-second. Contagious matter, generated by animals, has a greater tendency to affect animals of the same species which produced it, than others ; and the same parts in another individual which have produced or secreted it in one, rather than parts of a different nature. Thus, the contagious matter produced by the glands of the urethra in gonorrhœa, has a

greater tendency to affect other secreting parts, than parts which do not secrete.

Twenty-third. Whenever an accustomed stimulus is withdrawn from a part, or the whole, the action becomes imperfect and irregular, because an agent which was wont to contribute to its production is absent. This produces pain; for all new and irregular actions excite disagreeable sensations.

Twenty-fourth. The mind has the capability of perceiving and taking cognisance of the actions of the body; but if these actions be constantly repeated, we at last do not perceive them, or receive any sensation. Thus, we have no sensation from the performance of all the healthy functions, or parts of the natural action: or from the motion of the heart and arteries. But if the action be either imperfect, or in any respect new, then it produces a sensation, which, if violent, we call pain.\* If the heart contracts irregularly, or in a different manner from what it formerly did, then we feel it, and call it palpitation. All new general actions are attended with an indescribable uneasiness. When an ulcer is painful, we may be certain that the healing action is not going on; and, according to observation sixteenth, we may often cure it by such remedies as tend to abate the pain.

Twenty-fifth. Some actions are continued by habit alone. Any action which has continued long becomes in a manner natural, that is, excited and supported by the natural agents which were operating when it was first induced, and during the continuance which the action *necessarily* had on account of the strong action of the original exciting cause.

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\* We are not always to judge of the danger of an action by the pain which it produces, because some slight imperfections and irregularities in the action of a part will produce a much more acute sensation than some very dangerous actions. It is an old observation, that pain without inflammation may be borne long without very great injury to the system.

Many actions are thus kept up longer than they otherwise would be, and may then be interrupted by causes which, formerly, would not have operated to produce this effect. Other actions are said to be renewed, or restored by habit; an explanation of which has been already given.

Twenty-sixth. All general actions exhibit a certain revolution, or exacerbation and remission, at particular times or periods. In a state of health, we observe, that the power or energy of the system is greatest, and the action most perfect, in the morning. In the evening, the action is more imperfect, and the power less, in so much, that in very weak people, we even find a degree of fever induced. During rest,\* the performance of the functions, or the different parts of the natural action, is lessened, and the operations of the mind, which consume much energy by their continuance, are lulled or suspended. There is then a regular revolution, which must take place from the very first day in which we begin to observe regular periods of sleeping and working;† and this, by long continuance, and frequent repetition, comes to be so permanently established, that even although we remain the whole twenty-four hours without exertion, and in a recumbent posture, we should be sensible of the changes. This revolution, which takes place during health, continues also, by habit, during disease, although no greater exertion be made during the day than during the night; and, hence, we may account for the greater frequency of the pulse, and the exacerbation of many diseases toward the evening. The same ob-

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\* Man, in a state of nature, would naturally suspend his operations when the sun set, even although he was not led to do so from fatigue. He works through the day by the light of the sun; and retires, during the darkness of the night, to rest from his labours.

† In the infant, there are no regular periods for retiring to rest; but the child sleeps repeatedly during the twenty-four hours, at no stated intervals. The younger the child, the more sleep is required; that is to say, the less action can it sustain.

servation may also teach us, why we not unfrequently perceive remissions toward the evening, in diseases of an inflammatory nature ; because the natural action is naturally less toward night ; and, as the inflammatory action, in healthy people, consists in a morbid increase of the action, we may understand how there should be a diminution of this at night. The pulse, in acute rheumatism, is often quicker through the day than in the evening : but if the inflammation be of a different kind, it may be increased by the same cause which, in acute rheumatism, diminished it. Inflammation of strong parts, in healthy people, is increased by whatever increases the natural action, and vice versa ; but inflammation of weakened parts, or in reduced and weak bodies, is diminished by whatever tends to improve and strengthen the natural action. The one disease will be worse, the other better in the day than at night.

The state of the sun, but particularly the moon, with regard to our planet, likewise affects the human body ; and the way in which it does so has been already mentioned. When the attractive power of the moon operates most, the actions of the system, whether healthy or diseased, are most excited, that is to say, there is at that time an agent acting in a greater degree upon the body than at another time ; and, consequently, the action must, at that time, be greatest. When the attractive power is least, diseased actions are most easily overcome, if all the other causes be alike ; but, if other causes interfere, as often happens, this diminution will not be perceived. If this account be true, we shall see why, at certain periods of a lunation, diseases ought to subside most ; but every disease, in every person, will not subside equally ; for those which have recently commenced, will not be so much diminished as those which have continued longer, and are nearer their natural termination. If near the end of a disease, the termination may be hastened by the diminution

of the attraction of the moon; if, on the contrary, the disease be increasing, it will be aggravated by the other state of the moon, in which it acts most, and may thus prove fatal sooner than it otherwise would do.\* This being the case, I do not see that the doctrine of critical days can be explained by this general principle, which must either be allowed to act equally on all, and produce a crisis in every disease on the same day; or, as I have supposed, must operate differently according to the state of the disease, without any reference to the completion of a regular period, or certain number of days.



### *Conclusion.*

From the whole history of the nervous system, its properties appear to be wonderful indeed, and its delicacy seems to be so great, that we would at first suppose, that it should be perpetually subject to derangement, from the action of even the most trifling cause. But by a more attentive examination, we perceive here, as in other cases, with admiration, the workmanship of an infinitely wise and powerful Creator, who has established such laws in the animal economy, that, in many cases, these hurtful powers operate for their own destruction. When a foreign body is applied to the nose, it is expelled by sneezing: When it gets into the eye, the lachrymal gland, by its stimulus, pours out more tears, and the substance is washed out: When cantharides are applied to the skin, the cuticle becomes elevated, and

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\* The increased attraction of the moon will operate most visibly on the diseases which are increasing, whilst the effects of diminished attraction, will be most perceptible when the disease is declining.

the source of irritation is removed far from the true skin ; or, if it should reach to it, pus is soon formed, and the stimulus is again removed, more disagreeable effects being thus prevented. When a hurtful matter is received into the stomach and bowels, its first operation produces vomiting or purging, and thus causes its own expulsion, as is sometimes seen in over doses of arsenic, or other poisons. When much of the skin is inflamed, the action of the internal parts is diminished, the action of the heart is weakened, and the blood is sent less forcibly to the surface. The inflammation, which would otherwise soon have terminated in mortification thus more readily admits of resolution. When, on the other hand, the action of the cuticular nerves is weakened, the heart has its action increased, the blood is more powerfully propelled, and the nerves of the surface are soon again stimulated to their proper action. Equal nicety is displayed in the natural actions of the different parts of the animal, When, for instance, the light is faint, the iris opens to admit the most to the retina ; but when it is vivid, then the iris contracts, and allows a smaller portion of rays to enter.

These properties of the animal evince so much wisdom, that many have been led to imagine, that some intelligent agent presided in the system, and regulated all its actions. This agent has, by some, been believed to be the rational soul, and, by others, a certain preserving power of nature ; and, accordingly, the *vis conservatrix naturæ* has, at all times, held an eminent situation in the schools of physic. But the truth is, that the nervous system is so formed, that these happy effects take place regularly from the immediate action of stimuli, and not by the intermedium or direction of any third power. We are, accordingly, not led up to any visionary archeus, as a source of action ; but we are directed to admire the wisdom of the ALMIGHTY FRAMER of man, who established, in his system, the laws by which these ope-

rations are produced, when he “breathed the breath of life into his nostrils.”

Nor is this all which we have to admire in the economy of life; for the whole history of it is full of wonder; from the womb even to the grave. The conception of the fœtus; its growing from the uterus, like the leaf from the plant; connected to its parent by only a very slender vessel; its increasing by the nourishment of the mother; and its union with an *immaterial* and *immortal* spirit; are all mysterious, and truly wonderful points; but not more so, than its receiving, after birth, foreign matters into the stomach; its changing their life into its own, and converting them finally into a part of itself; its gradual increase from an imperceptible point to a full grown creature; and its equally slow and regular progress from maturity to dissolution; are topics which are, indeed, worthy to be seriously contemplated by the most exalted mind.

“Fearfully and wonderfully are we made.”

## DISSERTATION II.

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ON SIMPLE INFLAMMATION, AND ITS CONSEQUENCES.

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### *Of the Definition and Division of Inflammation.*

BY the term inflammation, is generally understood that state of a part, in which it is painful, hotter, redder, and somewhat more turgid, than it naturally is; which topical symptoms, when present to any considerable degree, or when they affect very sensible parts, are attended with fever, or a general diseased action of the system.

The most obvious division of the action of inflammation, is into that affecting strong and healthy parts, and that affecting those which are weak; and, therefore, the order inflammatae will consist of two genera, the inflammatio valida, and the inflammatio debilis: the specific distinctions will be the same in both of these genera, being founded upon the part affected: the varieties depend upon the duration and activity of the action: that which runs its course rapidly and actively, is called inflammatio activa, sive acuta; that which continues longer, and seems to have become, in a manner, habitual to the part, is termed inflammatio passiva, sive assuefacta. Some of the species will naturally admit of only the first variety.

It is the *inflammatio valida et acuta* which is here to be considered at greatest length: the *inflammatio debilis* will come to be attended to, in examining the causes and treatment of mortification: the little which is necessary to be said concerning the *inflammatio assuefacta*, will be mentioned in the conclusion of this dissertation.

### *Of the Stages and Terminations of Inflammation.*

In every extensive inflammation, we may always observe two stages, which are marked by different symptoms, those of the one being common to every new action, during its formation, whilst those of the other are peculiar to the disease at present to be considered.

In the first stage, the patient is weak and languid, and complains of coldness; the pulse is frequent and small; the tongue parched; the head somewhat confused or pained, and the functions of the stomach deranged.

In the second stage, the pulse becomes harder; the thirst continues; the coldness is succeeded by heat, and the patient becomes restless and uneasy. Whenever these symptoms appear, the local disease manifests itself, and keeps pace with the general affection: the part becomes red, painful, and swelled,\* at the same time that its function is impaired.

When this topical affection supervenes, the fever seldom, except in some specific diseases, abates; but, on the contrary, often becomes more violent, and continues until the local disease be either removed, or its nature be changed.

When inflammation is suddenly produced by any powerful cause acting locally, we find, that the local affection comes on first, after which the febrile symptoms appear. If, however,

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\* The softest parts swell most; those which are harder swell less, with the same degree of inflammation.

the local complaint be slight, and induced by a trifling cause, we do not find, that any general disease is induced, but the affection is entirely topical.

When the fever does not come on until after the establishment of the inflammatory action in a part, it is called symptomatic, being dependent entirely on the local affection: but when the fever precedes the topical inflammation, or is coeval with it, then it is said to be idiopathic, being produced by the direct operation of the same causes which induce the topical disease. In all cases, perhaps, the fever becomes symptomatic in the end.

When the local inflammation can be removed, without any very remarkable change being induced in the part, it is said to be resolved, or to terminate by resolution; a term which originated from the ancient doctrines on this subject. This is known to have happened, by the diminution at first, and afterwards the complete removal of the different symptoms, whilst the part slowly returns, apparently, to its natural figure, although, most\* frequently, there are adhesions formed with the contiguous parts.

When the pain, heat, and redness, disappear, but the part remains hard and swelled, the inflammation is said to end in schirrus. This termination is most frequent in glandular parts.

If, on the contrary, the pain, redness, and heat, continue great for some time, and then abate, the first becoming still more of the pulsatory kind, at the same time that the part remains swelled, but becomes gradually soft and fluctuating, and especially if this change be preceded by chillness, we may be certain, that the structure of the part is destroyed, and a

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\* Adhesions are formed in every instance where the inflammation is produced by mechanical injuries; but where it depends upon some general cause, adhesions do not always take place. This is exemplified by rheumatism, where adhesions are not necessarily produced.

new secretory action established, producing pus, which fills the cavity formed by the destruction of the inflamed parts. In this case, the inflammation is said to terminate by suppuration: at other times, especially in inflammation of membranous parts, which, in health, secrete a particular fluid, a liquid, different from pus, and resembling more the natural secretion of the part, is formed. In this, as in the other case, the inflammation diminishes; but the patient has seldom any chills; nor is the structure of the part injured, at least farther than by mere distension, if it be a cavity. The functions of the part are, however, often injured, from the presence of the fluid. This termination, which has been improperly called effusion, is not unfrequent in pulmonic affections, producing hydrothorax: It likewise produces the thick discharge from the nose, in catarrh, and the purulent looking discharge which takes place from the urethra, after the application of acrid matters.

Lastly. Violent inflammation in a part may kill it, in which case it is said to end in mortification. We are to apprehend this termination, when the inflammation is very violent, compared to the power of the part, and when it manifests no tendency to any of the other terminations. We are still more to dread it, when the colour of the part becomes of a darker hue, and the pulse more frequent and feebler, at the same time that the general strength sinks. In these circumstances, if the disease be not checked by proper remedies, the mortification soon appears: the part becomes first of a purple, and then of a black colour: it loses its heat; the cuticle rises up in blisters, and the part soon becomes soft, putrid, and quite senseless. This termination does not take place without much pain; for although the part, after it mortifies, has no feeling, yet, during the process, the sensation is very acute; and, even after the mortification is complete, the parts in the immediate vicinity are excessively irritable, being

nearly in the same state in which the mortified part was before it died.

When the mortification effected only the cellular substance, it was supposed to be of a milder nature, and was called gangrene; but when it penetrated deeper to the muscles or blood-vessels, it was called a sphacelus.

### *Of the Exciting Causes of Inflammation.*

Whatever increases the action of a part, beyond that relation which ought to subsist betwixt the action of a part and its power, is productive of inflammation. The causes which effect this may be divided into two classes; first, those which act directly on the part to which they are applied; second, those which are not applied to the part which becomes inflamed, but which act indirectly on it.

The first kind admits of two divisions. First, those foreign agents which operate by what is called their stimulant power, such as cantharides, heat, &c. This operation having been already explained in the preliminary dissertation, it will be unnecessary to make any further remark on it here. Second, those causes which act mechanically, such as bruises and wounds. Bruises act, I apprehend, in the same way with cold, when it appears to inflame the part to which it is applied; and, therefore, their action will be explained in considering the operation of cold. If wounds be put into a proper situation of uniting, we generally find, that no inflammation takes place; but the structure of the part is directly renewed, by the operation of the same power which nourishes the part in health, and renews its structure when absorbed: But if from any cause this be prevented, then inflammation comes on, from which we may presume, that the prevention of the action of nutrition produces the inflammatory action; for if, by removing the sides of the wound from each other, or by

any other cause, we inevitably prevent the natural action of deposition, or nutrition, then the most trifling cause will induce the inflammatory action; even the circumstance of being in an unusual situation, will be sufficient to excite the action to a morbid degree.\* On the other hand, the presence of the inflammatory action, will be sufficient to prevent the action of nutrition, if it should be excited by the operation of the cause which produced the injury; for the wound is often inflicted in such a way, or with such pain, as to increase the action to such a degree as to form inflammation; and this cause will more especially operate, where we interrupt the uniting process, or action of nutrition: It is even often sufficient to cause inflammation, when we use every precaution to forward the uniting process. Cold is very often found to inflame the part to which it is applied; but it has not been deemed easy to give such an explanation of its action as would be applicable to every case. It was, at one time, supposed to operate, by producing stagnation of the blood, or humours in the part; but the two opinions which I shall at present mention, are, 1st. That it acts as a stimulant; 2d. That it acts as a sedative.

In support of the opinion, that cold is a stimulant, it may be urged, that it produces pain, when applied in too great quantity; that it reddens the skin, and often inflames the part on which it acts; and, finally, that it invigorates the system, when applied in moderation.

It must, however, be evident to every one, that cold lessens the action, either of the whole system, or of a part, according to the mode of its application; and that, if it be long enough continued, it will produce, first, torpor, and then death. This is so fully established, that it is unnecessary

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\* Mr. Hunter supposes, that the "stimulus of imperfection immediately calls forth the action of restoration," which is effected by means of inflammation.

*Hunter on Inflammation, p. 190.*

to insist upon it ; and must prove, that cold is not a stimulant. Pain is produced, both by an increase and diminution of action ; and, therefore, we are not to be surprised, that cold should be productive of a very unpleasant sensation or pain. The absence or diminution of any accustomed stimulus, must be productive of pain ; and this pain will be violent, in proportion to the extent and continuance of the diminution. The want of food produces, 1st. Slight uneasiness, and then more acute pain ; and the same may be said of heat. Whenever any natural and accustomed stimulus is withdrawn, the action of the part is performed irregularly, and becomes imperfect, which is always attended with a disagreeable sensation : But, besides this cause of pain, there is also another, which comes to operate after the cold has been applied for a considerable time, namely, that the action of the neighbouring parts is communicated by sympathy to the cold part, which occasions an action in it greater than the power can sustain, and, consequently, produces a species of inflammation.\* There are, likewise, several causes which may be applied at the same time with the cold, and which will tend to excite action, and, consequently, produce pain in the weakened part. Thus, the percussion of the air stimulates and causes pain ; hence, rain or snow, drifted in the face, produces much more pain than when it flies more gently, although, in both cases, the temperature be the same.

That cold produces redness, is no proof that it is a stimulant ; for this redness is, at first, produced by a diminished circulation, the blood remaining longer in the veins ; and, therefore, the part becomes of a purple hue, which is very different from the bright red, produced by the direct action of a powerful stimulant.

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\* See Prelim. Dissert. p. 123.

It may also be said, that cold stops bleeding, and that alcohol does the same, therefore cold is a stimulant ; but it is to be remembered, that there exists this material difference, that cold stops active, and alcohol passive hæmorrhage. Cold has likewise been supposed to be a stimulant, from the invigorating effects of the cold bath ; but, in order that cold may invigorate, it is necessary that it be applied for only a short time, and be frequently repeated ; it thus, by diminishing the action of the surface, increases that of the internal parts, and thus strengthens. That cold does not inflame, by its stimulant power, will be immediately seen.

Those who maintain cold to be a sedative, have been under the necessity of maintaining, that it never inflamed unless some direct stimulant was afterwards applied ; or that, by relaxing the vessels, it made them admit more blood, and thus produced a kind of inflammation ; but it is to be remembered, that in the living system, blood does neither accumulate in a part, nor is its quantity diminished by any general mechanical cause operating on other parts, or by any affection of the propelling cause, but that the state of the vessels, with regard to blood, depends upon their own condition. Weakness, in any part of the arterial system, ought to diminish the quantity of blood in that part : Weakness, in the venous system, will indeed produce accumulation of blood ; but this cannot produce inflammation. Cold, then, cannot act by its relaxing power. Experience likewise proves, that cold may induce inflammation, without requiring, for this purpose, the subsequent application of heat, or any other artificial stimulus.

Cold may operate on a part, and destroy it in three different ways. First, it may be applied in such a degree, and for such a length of time, as to destroy the vitality of the part directly ; in which case, sloughs are formed. Second, it may be applied in a less degree, or for a shorter time ; and afterwards a stimulant, such as heat, may be applied, which

will excite inflammation. The production of inflammation, by any agent, depends, in a great degree, upon the suddenness of the operation of the agent which excites it; for a quantity of stimulus, which, if suddenly applied, will produce inflammation, may be applied slowly with impunity. From which it will follow, that any given stimulant must more easily produce inflammation, in a part which has a low action, than in one having a vigorous action, there being a greater disproportion in the one case than in the other, betwixt the action induced by the agent and the previous action of the part. Hence, very slight stimuli will induce inflammation, in parts which have been weakened by cold. Third, it has been already mentioned, that a part sympathises very much with those which are contiguous to it. If a part be weakened, by having its action reduced, and if then the debilitating cause be removed, the action of the part will be increased, or excited, by its sympathy with the neighbouring acting parts: But, as the action ought to be very little, the power being small, it will follow, that disease, or inflammation, must arise from this cause, the action being increased beyond the power. We ought, therefore, in this case, to diminish the action of the neighbouring parts, in order to prevent their extending their action to a part which is not able to bear it without becoming diseased.

These remarks may suffice, with regard to the causes of inflammation which belong to the first class. I come now to consider those of the second kind, or those which operate, not upon the part to which they are applied, but upon distant parts, the chief of which causes is cold.

Cold, applied to the surface of the body, often inflames the internal parts. This has been often observed, and various explanations of it have been attempted; whilst others have denied the existence of the fact.

Dr. Brown supposed, that cold, at no time, produced inflammation of internal parts, unless it were applied to those parts, and had heat applied after it ; or, in other words, that cold acted always in one way, and never on any part to which it was not directly applied. He, therefore, classed the lungs amongst the external parts, in order to account for peripneumony being produced by cold. He did not remember, however, that the pain and cough sometimes make their appearance, whilst the patient is still exposed to the cold, and before heat has been allowed to operate. He likewise forgot, that the temperature of the lungs is not affected by the temperature of the surrounding air, being neither warmed by warm air, nor cooled by cold air. The lungs are to be considered as the centre of the circulation, with regard to animal heat, the heart being only a muscle subservient to them. But, granting that the lungs could be warmed or cooled, it is to be remembered, that a person riding in a cold night, will often have a sore throat, or pain in his breast produced, (if the integuments covering these parts have been exposed,) before he alight, and, consequently, before he could be exposed to heat. If this take place in one instance, the theory must be false.

Dr. Cullen supposes, that cold inflames distant parts, by affecting the course of the fluids. When applied to the surface, it inflames the lungs, in his opinion, by obstructing the perspiration, and thus determining to the lungs. Cold is likewise applied, he supposes, to the lungs themselves, at the same time.\* Now, were this the case, the lungs ought not to be affected : for if cold were capable of acting on the lungs, it should obstruct the exhalation from them, as well as the perspiration from the skin ; therefore, some intermediate point, and not the lungs, would be injured.

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\* Cullen's First Lines, &c. Vol. I. par. 315.

The same idea, although with some modification, is adopted by Mr. Abernethy,\* who supposes, that air is thrown out from the blood, along with the matter of perspiration ; and, therefore, that when the perspiration is diminished, the determination of fluids to the lungs is particularly to be expected ; because, as the air which went off with the perspiration is now retained, it goes to the only other place where it can get out, namely, the lungs, “where the secretion is similar to the one which has been suppressed ;” by which suppression the blood has “become surcharged with air, to which the lungs only can afford an outlet.”—“Thus, an accumulation of fluids, in the pulmonary vessels, will ensue.”

These explanations of the action of cold, evidently overlook the action of the nerves, and the true history of diseases ; for no “increased determination of fluids” can take place without increased nervous action. The sympathies of fluids and vessels, were once indeed, favourite doctrines in the schools ; and the trifling and uncertain anastomosis of arteries or veins were anxiously looked for. But the fluids must now be considered as subordinate agents, and the changes and diseases of the living system traced to a higher source than hydraulic principles.

Seeing, then, that none of these opinions give a satisfactory explanation of the manner in which cold, when applied to the surface, inflames the internal parts, we must have recourse to another principle, or to the sympathy of equilibrium, by which, I apprehend, the fact may be sufficiently explained.

Cold, applied in a moderate degree, to the whole surface, diminishes, for a time, the action of the skin, but raises that of the internal parts, and thus produces strength, if the application be frequently repeated ; these parts being the most

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\* Abernethy's Essays, p. 150.

essential to the animal, and those on which its health and vigour chiefly depend.

This effect of cold, in raising or exciting the action of the internal parts, when applied to the surface, is also seen in the benefit which is derived from dashing cold water on the thighs and legs, in cases of costiveness or suppression of urine, depending on torpor of the intestines or bladder. Upon the same principle, we may account for the occasional bad effects of the cold bath, when applied partially; for, in this case, the parts which are out of the water, may have their action morbidly increased, by the diminution of action in those parts which were immersed. Hence, the popular opinion, that if bathers do not plunge the head under the water, they will have head-ache produced, is not totally without foundation.

If the cold be applied to the surface for a considerable time, or to such a degree as to reduce the temperature of the skin considerably below that which obtained before the application, inflammation is very frequently produced, in some internal part, owing to the morbid increase of action which is thus produced in it. What part shall suffer thus, will, in a great measure, depend on the portion of the surface which is exposed, each part of the skin sympathising chiefly with the organs immediately under it. Cold and damp, applied to the feet, are very apt to produce inflammation of the throat.

Cold will most readily produce inflammation, when the surface has had its action previously much increased by heat. When the skin of the throat or breast is very warm, and is suddenly exposed to cold, cynanche or pneumonia is, in nine cases out of ten, produced.

From these remarks we may understand, first, how cold applied to the surface, in a certain degree, and for a certain time, inflames the internal parts; second, how, when it is applied to a greater degree, and continued for a longer time, it inflames the part itself on which it directly acts.

It is observable, that some people are more subject to inflammation than others ; and, by examination we shall find, that these are the most vigorous and plethoric. This condition, from its propensity to inflammation, has been named the phlogistic diathesis. This state is induced by the use of stimulating and highly nourishing diet, invigorating exercise, and the application of cold in such a way as to prove tonic.

Inflammation is readily induced in such people, and is worse borne by them, because, as Mr. Hunter has observed, their action is already as high as it can possibly be, without causing disease. A very trifling increase, then, which will be easily induced, must be productive of inflammation. Hence, operations are borne worse by healthy people than by those who have been ailing for some time. There is, however, another cause which co-operates with this, and renders operations safer in those who have had local diseases of long continuance, than in those who have met with sudden accidents, namely, that the constitution has been long accustomed to diseased or inflammatory action, and therefore, is better able to endure the action which is induced by the operation ; for morbid actions, which are suddenly excited in a healthy system, are more dangerous than those which come on more slowly. Even if the previous action had not been inflammatory, it was of a morbid nature, and therefore, should make the action induced by the operation less dangerous ; because we have still only exchanged one diseased action for another, and not excited it in a system formerly healthy.

### *Of the Proximate Cause of Inflammation.*

Concerning the proximate cause of inflammation, a very great diversity of opinion has prevailed ; but still almost every theory has agreed in admitting the agency of an obstructing cause.

For several centuries, the opinions which were held on this subject were very much the same, and received no material change until the discovery of the immortal Harvey.

Whilst the circulation of the blood was unknown, and whilst the hypothetical notions of the power of the liver, in preparing and sending forth this fluid, continued to prevail, it is not astonishing that the theories of physic should be exceedingly imperfect. So fully persuaded were physicians of the existence and agency of different humours and spirits, and so little did they know of the regular and constant motion of the blood, that they believed in the possibility of depositions and congestions of the blood, the bile, or the lymph; and acknowledged these as the cause of inflammation. Their anatomists taught them, and their professors of physic supported the opinion, that the liver was the centre of the vascular system, from which the blood went forth by day to the extremities, and returned again by night. If, then, any peccant matter irritated the liver, then the blood was sent out more forcibly; and if, at the same time, any part of the body were weakened, or otherwise disposed to receive a greater quantity of fluid than the rest, then a swelling was produced by the flow of the humours to this place. *Fluxions*, or flows of humour to a place, might happen either by weakness of the part, which allowed the humours to enter more abundantly, or by the place attracting the humours, in consequence of the application of heat, or other agents. When the fluxion was produced by some irritating cause applied to the source of the blood or humours, and a weakness of the part affected, then the part was said to be passive; but when the fluxion arose from some cause, acting directly on the part, and making it attract the humours, then it was said to be active. The teachers of medicine, then, had two great heads for commenting on; first, the state of the part transmitting; and second, the condition of the part receiving. The peculiar na-

ture of these tumors depended upon the humour which was sent in the greatest abundance ; blood, for instance, produced the true phlegmon ; bile produced erysipelas, &c.

It was likewise believed, that at other times, the part might somehow allow the blood or humours to stagnate slowly in it, from a want of expulsive power ; or might detain the fluid, “ quæ in loco affecto gignitur.” The tumor thus produced, was called a *congestion*, to distinguish it from the one which arose from the sudden flow of humours from a distant part, and which was called a *fluxion* or *defluxion*. The first was formed gradually, without much pain, or the feeling of pulsation, and run its course slowly ; the second appeared suddenly, was very painful, had a pulsatory feeling, and run its course rapidly.

As the blood was supposed to possess very little motion, and to have its course easily diverted or changed, by very trifling causes, it became an established rule, that in fluxions, we should endeavour to alter the direction, or “ determination,” of this fluid. In recent inflammation, they laid it down as a fixed principle, to bleed from some part which was distant from the seat of the disease, by which they imagined, that the current was changed, and a *revulsion* made. If the inflammation was above the liver, which they said, was the centre of the body, considered medically, they took blood from some part below it ; when one side was affected, then they bled from the other. They likewise made a catalogue of the different veins which purged the different parts, or detracted from them ; and this assisted them in their practice. The cephalic vein evacuated the head ; the basilic, the parts farther down ; whilst the median detracted from both parts : the left arm evacuated the spleen, and the right one the liver.\*

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\* The natives of Thibet and Boutan still retain similar sentiments : they bleed in the neck, when they wish to cure pains in the head ; the cephalic vein is open

A revulsion was also effected, by raising a tumor in some other part, by means of ligatures, cupping glasses, &c.; or, by giving nature an opportunity of discharging the humours from distant parts, by applying leeches or blisters to these: hence, sinapisms were applied to the feet, in diseases of the superior parts.

If it were not convenient, or if it were not judged proper, to make a complete revulsion, then blood was drawn from the neighbourhood of the parts,\* and this was called *derivation*, which differed from revulsion only “in the measure of the distance to which the humour was drawn.” As this, however, was supposed rather to draw more fluid to the part, than to draw from it, most people considered it as dangerous to use derivation in the beginning of the disease.

At the same time that bleeding was used copiously, they also applied repellents to the part, in order to co-operate with the other remedies. These consisted of astringents, mixed with an innumerable quantity of inert drugs. If, on the contrary, it was thought improper to repel the matter, then the tumor was to be resolved by “discussion,” or a “breathing out of the humour, by insensible transpiration;” and this was effected by applications, which were said to be “hot, subtle, and powerfully penetrating; such as, althea, camomile, nitre, alkali,” &c. This method, however, was generally reprobated, in the commencement of inflammation. When neither of these plans would succeed, then the matter was to be concocted, the tumor suppurated, mundified, deterged, incarnated, and finally cicatrized.

Bleeding was directed to be less frequent in the congestion than in the fluxion; but then the purges were to be stronger,

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ed, when the arm or shoulder is injured; the median detracts from the breast or side; the basilic from the belly, and the veins at the ankles from the two inferior extremities. Vide Phil. Trans. vol. LXXIX.

\* In inflammation of the throat, for instance, blood was taken from the lingual veins.

and given with a more liberal hand.\* Along with the exhibition of purgatives, the hot remedies, called discutients, were to be applied to the part itself; such as, thyme, galbanum, sal ammoniac, &c.

At last, the doctrine of fluxion began to lose ground, and the physicians slowly to perceive, that their boasted theories of derivation and revulsion were absolutely incompatible with the true history of the circulation of the blood. The cause of inflammation was now sought for, more universally, in the part itself, and obstruction declared, more decidedly, to be the parent of disease.

It was the opinion of Boerhaave,† that inflammation was caused by an obstruction to the free circulation of the blood, in the minute vessels; and this obstruction, he supposed, might be caused by heat, diarrhœa, too copious flow of urine, and sweat, or whatever could dissipate the thinner parts of the blood, and produce a thickness or viscosity of that fluid. Where this lentor did not exist before the production of inflammation, he imagined, that the larger globules of the blood got into the small vessels, and thus plugged them up. When, for instance, the perspiration was stopped, the fluid being retained, dilated the vessels, and allowed some of these mischievous globules to enter, and produce a more permanent obstruction. This circumstance was termed an error loci, and was one of the chief causes assigned for inflammation. But whether the obstruction arose from the viscosity of the blood, or, independently of it, from an error loci, the same effect was supposed to be produced, namely, a resistance to the circulation, which, of course, increased it in the other vessels, proved an irritation to the heart, and increased the

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\* In fluxious, purging was considered as a dubious remedy, at least, where the liver was in fault; because it was thought to draw all the foul and noxious matters to that quarter.

† Aph. 375. et seq.

force or attrition of the blood, in that part of the vessel which was behind the obstruction ; this, again, caused heat and pain, whilst the accumulation of the blood produced redness ; which three symptoms are the essence of the disease. But, besides this obstruction, he also brought into account an acrimonious state of the fluids ; and, when this occurred, resolution was out of the question ; nay, if the acrimony were great, gangrene was almost unavoidable.\*

The viscosity of the blood cannot be admitted as the proximate cause of inflammation ; because we have no proof that this state ever exists ; or, granting that it did, it would not explain the phenomena. In inflammation, the blood, so far from being deranged in the proportion of its component parts, or from one portion having a greater quantity of coagulable lymph (which alone could make it thicker) than another, seems to have its principles more intimately united ; for it requires a longer time to separate them by coagulation ; and, therefore, no variation can take place, in any particular part of the body. If, then, a viscosity takes place, it must exist equally in every portion of the blood ; and, if so, it must affect every part of the body alike ; and, therefore, cannot be supposed to produce only a local disease. But, granting it to be *possible* for viscosity to induce inflammation, it remains to be demonstrated, how this lentor is occasioned, by causes which bring on inflammation suddenly, without affording time for changes of the fluids to take place. It also remains to be proved by experiments, that such a thickened state of the blood ever does exist, either in inflammation, or in any other disease.

With regard to the doctrine of error loci, or of red globules going into vessels which did not formerly transmit them, the fact must be admitted, at the same time that the con-

clusion is denied. When the eye becomes inflamed, the tunica conjunctiva is seen, with its vessels full of red blood, which, in health, is not the case; but this redness never appears until the inflammation has commenced; it is therefore to be considered as an effect, and not as a cause. Nor does this error loci occasion any obstruction in these vessels; for, if they be divided, the blood flows freely, which shows, that they are large enough to allow of an easy circulation, a circumstance which is altogether incompatible with the notion of obstruction: For, were this obstruction to take place, the flow of blood must be checked; it must either move much more slowly, and, therefore, stimulate less; or, it must take another course; for it is well known, that, whenever a vessel is obstructed by pressure, by adhesion, or by a globule plugging it up, that less blood must go that way, and more by another course; the consequence of which is, that the part will rather be weakened than inflamed.

As for the supposition of the co-operation of an acrimony of the fluids, it may be sufficient to observe, that the proportion of the saline matter of the blood has never been proved to be greater in this than in any other state of the body, and that the very idea of cacochymy is diametrically opposite to the laws of the living system. But enough has been formerly said, in the preliminary dissertation, concerning the humoral pathology; and more will be afterwards adduced. The subject may, therefore, for the present, be dismissed.

Professor Vacca,\* was likewise of opinion, that an obstruction to the motion of the blood was the cause of inflammation; but this he attributed, not to lentor, or error loci, but to a debility of the inflamed part, which prevented it from propelling the blood as formerly, and produced an accumulation of it in the weakened vessels, the consequence of

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\* Vacca de Inflam. Morb. &c

which, in his opinion, was a species of combustion, or real inflammation. He begins by observing, that there are four principal fluids in the body ; the blood, the lymph or serum, the fat, and the nervous fluid. The lymph, being watery, cannot be inflamed or burnt ; the blood is slightly inflammable ; the fat is altogether so ; but the nervous fluid, from its volatility, cannot bear enough of heat to inflame it. It is also laid down as a principle, that no inflammation can take place without the aid and operation of atmospheric air, which both draws inflammable matter to the part, and inflames it. Without fatty, or phlogistic matter, then, and air, no inflammation can take place. This inflammation is begun by the accumulation of blood, which is to be considered as a heated, or ignited body. The accumulation and “semistagnation” of the blood, uniformly depends upon a weakness of the part, either real or absolute ; real, when its power is positively diminished ; relative, when it is not diminished, but the strength of the rest of the system preternaturally increased above it.\*

In consequence of this weakness, the blood not only moves more slowly, but more also flows in, which produces a swelling of the part. This is farther increased, by the extrication of air from the stagnant matter, in consequence of the heat, by which the part is distended, and still more humour and phlogistic matter is allowed to flow in.

Upon the humoural part of this theory, I deem it to be unnecessary to make any observation ; and, upon the position, that debility of the inflamed part is the cause of inflammation, I think it sufficient to observe, first, that many of the

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\* “*Inflammatio cujusvis partis humani corporis, numquam sit, nisi in ipsa parte sanguis coacervetur, et fere quiescat.*”—“*Coacervatio et semistagnatio sanguinis, vel alius humoris corporis humani, in quacumque ipsius corporis parte minime contingere potest, sine ipsius partis absoluta, vel relativa debilitate.*” Vacca, p. 12.

exciting causes evidently have no tendency to weaken, when they induce inflammation: Heat, for instance, frequently inflames before it can possibly be supposed to have produced any weakness. Second, all the symptoms of inflammation evince an increased action. Third, bleeding, and other causes, which diminish action, cure inflammation.

Dr. Cullen considers the proximate cause of inflammation to be "a spasm of the extreme arteries, supporting an increased action in the course of them." This theory, therefore, differs from that of Dr. Boerhaave only in the cause which is assigned for the obstruction. A detection of the fallacy of the one supposition will, therefore, be sufficient to disprove both. But, as Dr. Cullen was a man who formed no opinion without a plausible reason, it will be proper to attend more minutely to his doctrine; and this is very plainly laid down in the two hundred and forty-fourth and two hundred and forty-fifth paragraphs of his *Outlines*. "Some causes of inequality (says he) in the distribution of the blood, may throw an unusual quantity of it upon particular vessels, to which it must necessarily prove a stimulus. But, farther, it is probable, that, to relieve the congestion, the *vis medicatrix naturæ* increases still more the action of these vessels; and which, as in all other febrile diseases, it affects, by the formation of a spasm on their extremities."—"A spasm of the extreme arteries, supporting an increased action in the course of them, may, therefore, be considered as the proximate cause of inflammation; at least, in all cases not arising from direct stimuli applied; and, even in this case, the stimuli may be supposed to produce a spasm of the extreme vessels."

These paragraphs contain three positions; 1st. That there is, originally, a congestion, or accumulation of blood; 2dly. That this is removed by the formation of a spasm; 3dly. That this spasm is the work of the *vis medicatrix naturæ*.

Upon the first of these positions, it will be sufficient to remark, that this accumulation of blood is considered as the cause of inflammation, and not as an effect; whereas, it is evident, that it exists only as a symptom. When, for instance, we apply heat, a blister, or any acrid substance, to the surface, the part is stimulated, that is to say, the action of its nerves is increased, which must, consequently, increase the action of its vessels, and, of necessity, the quantity of blood. But, most assuredly, this increased quantity of blood is not the primary cause of inflammation; it is the consequence of an increased action of the blood-vessels, which, again, is merely an effect of the increased nervous action. The first position is, therefore, erroneous; for this accumulation of blood is not an original, or primary cause, but depends upon a disease already induced. At the same time, it is certain, that this increased quantity of a stimulus must react on the nerve, and augment still farther its action, and, therefore, increase or keep up the inflammation already induced.

The second position takes for granted that the first is established, and that the congestion is to be removed by the formation of a spasm; or, in other words, that the accumulated quantity of blood is to be propelled, or dismissed, by rendering the extremity of the passage narrower, and the circulation more difficult, which is a contradiction in terms. The obvious effect of this constriction must be, to destroy the free communication of the artery with its returning vein. The blood already in the part must stagnate, and become venous, or it must escape by a retrograde motion, the existence of which, to any extent, is not proved. Whenever a vessel is constricted, either by a ligature, or any other cause, we uniformly find, that the course of the circulation is altered, more being sent through the branches of the artery coming off above the obstruction; therefore, the part direct-

ly supplied by the obliterated or constricted artery must, for a time, be weakened. It may be said, that though the part supplied by the obstructed vessel may be debilitated, yet those parts which, in consequence of this obstruction, must receive more blood, will be inflamed: But we daily find, that, even tying a large vessel, does not of itself produce this disease; how much less, then, will constricting the extremities of a few twigs be capable of affecting it? The uniform effect of obstruction must be, to retard the circulation, and produce torpor, circumstances altogether incompatible with the existence of inflammation, which implies more powerful contractions, and a more complete and forcible circulation. Phlegmon is also attended with an effusion into the cellular substance from the extremities of the arteries, a circumstance not easily explained upon the principle of obstructed circulation.

The third position is, that the formation of the spasm is the work of the *vis medicatrix naturæ*; but, having denied the truth of the former position, it follows, that the present supposition requires no answer; because it is unnecessary to show the absence, or insufficiency of a cause, if the existence of the effect be disproved. Still it may not be improper to remark, that the spasm induced, or the agency of the *vis medicatrix*, is considered as producing the most serious part of the disease. It is not the congestion of blood which is held out as the proximate cause, but the attempt which the healing, or preserving power of nature makes to get quit of it. The blood is here considered as an exciting cause, but is by no means understood to operate directly; on the contrary, it only gives notice to the preserving power, which, in order to get rid of it, occasions a spasm, followed by disease. Nay, so far does Doctor Cullen carry his theory of spasms, and preserving powers of nature, that he imagines, that even stimulants, operating directly on a part, such as

cantharides, mezereon, or red precipitate, induce inflammation, in the same round-about way. But, by a very little attention, we shall find, that all these agents operate primarily on the nerves, increasing their action, and changing it, and, of consequence, the action of the vessels supplied by them. This action, however, is very different indeed from spasm or obstruction.

The celebrated John Brown taught a doctrine, which was new to the Edinburgh Professors, and diametrically opposite to the theories which were maintained in their schools. Diseases, according to his system, were all divided into two classes, those which consisted in a morbid degree of strength, and those produced by the varied degrees of weakness. This theory was, to appearance, simple; it was built entirely on the sthenic and asthenic diathesis, and admitted of no intricate actions of the living system. Little labour, then, was demanded of the student, and not much reflection of the practitioners. It was addressed, in a peculiar manner, to the indolent dispositions of mankind, and, therefore, met with considerable success, which perhaps was not a little increased by the plea of persecution.

Inflammation was said, by Dr. Brown, to depend either upon too much strength, or too much weakness. In the first case, the vessels contracted with great force, and pushed on their contents with fury. In the second, the vessels were too weak to carry on the circulation properly, but relaxed freely, to allow as much blood to be pushed into them, as the vis a tergo was able to do. This, however, is by much too mechanical an idea, and cannot be admitted, now that the reasonings of the mathematical physicians have sunk into oblivion. The whole series of symptoms, together with the circumstances which frequently attend the accession of inflammation, as well as its ending in other actions, disprove the supposition. If inflammation depended, in one case,

upon too much contractile force of the vessels, and, in another, upon their relaxation, then, in order to give consistency to the doctrine, it ought to be admitted, that secretions were formed by filtration; and that these states of the vessels, after a certain duration, came to strain through pus. Mere increase of strength, excitement, or contractile power, without a change of action, never can produce the phenomena of inflammation, nor account for adhesion, suppuration, or ulceration. Partial debility of the vessels cannot, on the other hand, produce the second species of inflammation: because this debility should, at the very utmost, produce only a slower circulation, and not an inflammatory action; neither ought it to be the cause of swelling and turgidity of the arteries, by allowing more than the due quantity of blood to be forced into them; for the quantity of blood in a vessel, does not depend upon the proportion betwixt its contractile power, and the propelling power of the rest of the system, but upon its own action entirely; otherwise, we should find paralytic limbs always turgid with blood. Farther, the Brownian theory will not explain the phenomena of inflammation in weakened parts; for here there is a great action, with little power; and hence the part is almost immediately killed. The progress of this is stopped by bark and opium, with proper local applications. From the treatment, then, the Brownian would say, that the inflammation depended upon weakness. But will simple relaxation explain why death should so rapidly take place?

According to Mr. Hunter, "inflammation is to be considered only as a disturbed state of parts, which requires a new, but salutary mode of action, to restore them to that state, wherein a natural mode of action alone is necessary. From such a view of the subject, therefore, inflammation, in itself, is not to be considered as a disease, but as a salutary opera-

tion, consequent either to some violence, or some disease.”\*  
 “The act of inflammation is to be considered, as an increased action of the vessels,”† which at first consists simply in  
 “an increase or distention beyond their natural size.”† This increase seems to depend upon a diminution of the muscular power of the vessels, at the same time that the “elastic power of the artery must be dilated in the same proportion.”§ This is, therefore, something more than simply a common relaxation; we must suppose it an action in the parts, to produce an increase of size, to answer particular purposes; and this I should call an action of dilatation.” The whole is to be considered, “as a necessary operation of nature.”|| Owing to this dilatation, there is a greater quantity of blood circulating in the part, “which is according to the common rules of the animal economy; for, whenever a part has more to do, than simply to support itself, the blood is there collected in larger quantity.”\*\*\* The swelling is produced by an extravasation of coagulable lymph, with some serum; but this lymph differs from common lymph, in consequence of passing through inflamed vessels.†† It is this lymph which becomes the uniting medium of inflamed parts; vessels shoot into it; and it has even the power of becoming vascular itself.‡‡ The pain proceeds from spasm.§§ The redness is produced, either by the arteries being more dilated than the veins, or because the blood is not changed in the veins.|||| When a part cannot be restored to health, after injury, by inflammation alone, or by adhesion, then suppuration, as a preparatory step to the formation of granulations, and the consequent restoration of the part, takes place.\*\*\* The vessels

\* Hunter on Inflammation, p. 249.

† P. 278.

|| P. 282.

†† P. 369.

\*\*\* P. 371.

‡ P. 279.

\*\*\* P. 280.

§§ P. 386.

§ P. 282.

†† P. 311.

|||| P. 381

are nearly in the same state as in inflammation; but they are more quiescent, and have acquired a new mode of action.\*

Inflammation, according to this, as well as some other doctrines, is to be considered, not as a disease, but as a salutary operation of some wise and provident power, performed in order to rid the system of some impending evil, or to renew a structure, which could not otherwise be restored. But I hold it to be an established point, that there is no supposition more directly contrary to true philosophy, or to the principles which reason teaches, than the opinion, that certain events take place, merely because these events are useful; as, for instance, the coagulation of the blood in mortification;† whether we refer these events to the agency of some peculiar power called nature, or to the more extensive operation of some general principle.

Inflammation is, in many cases, so far from being a “salutary mode of action,” that, in a great majority of instances, it is a most dangerous and a most troublesome disease; and I shall presently endeavour to show, that it is not through the interference of this action, that divided parts unite; but that, on the contrary, whenever the action becomes inflammatory, that then no union and no restoration take place, but the sides remain separate, until the disease subside.

Inflammation is considered as “an increased action of the vessels,” which chiefly consists in a greater degree of dilatation, the power of muscular contraction seeming to give way. This allows more blood to enter; which greater quantity of blood is not considered as a symptom or part of the disease,

\* Hunter on Inflammation, P. 372.

† “For this purpose, (coagulation,) it (blood) requires rest, either by extravasation, or being retained in the vessels, till the utility of circulation is lost, or till it can answer some good purpose by its coagulation, as in mortification.” *Hunter on the Blood*, &c. p. 86.

but as one of the contrivances of nature, the part having more to do than simply to support itself.

How far the loss or diminution of muscular power will account for this dilatation, will afterwards be examined. Here I shall only observe, that the doctrine of the simple increase of action, (circulating action,) in a vessel, or simple dilatation, never can explain the production of inflammation, which is to be considered as a state which is new and diseased, and totally different, both in its nature and consequences, from the condition which subsists in health. The other parts of the theory will come afterwards to be considered.

According to Dr. Darwin, when any part is excited "into such violent motion, that a quantity of pleasurable or painful sensation is produced, it frequently happens, but not always, that new motions of the affected organ are generated, in consequence of the pain or pleasure, which are termed inflammation. These new motions are of a peculiar kind, tending to distend the old, and to produce new fibres, and thence to elongate the straight muscles, which serve loco-motion, and to form new vessels, at the extremities or sides of the vascular muscles."\* Upon this theory I shall only make three observations: First, the effect of inflammation or sensation, is considered as its cause: Second, we very frequently have highly pleasurable sensations, or great pain, excited in a part, without any production of inflammation; therefore, if the supposed causes of inflammation have existed, and no circumstances have occurred capable of counteracting their operation, it will follow, that these causes are not real, but imaginary: Third, the motions which are supposed to take place, are not sufficient to explain the phenomena of the disease.

From an attentive examination of the operation of the exciting cause of inflammation, and from a view of its different

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\* *Zoonomia*, Vol. I. p. 395, 396.

symptoms, we cannot admit the proximate cause to consist in viscidily, or error loci of the blood, or spasm, or simple increase of sthenic or asthenic diathesis, or actions of dilatation, or increased sensation, but must, upon the principles already laid down, consider it as a new and distinct action of the living system. When this action is uncombined with any other morbid condition, the disease is simple inflammation; but when to this another action is united, or when the inflammatory action is modified, the disease is no longer simple, but specific inflammation.

In examining new actions, we find it to be of use to compare them with those which they resemble most, and with which we are better acquainted. It has been already mentioned, that whatever tended greatly or suddenly to increase the natural action of a part, changed it, and produced inflammation. This we learn, from examining the exciting causes of this disease; and, by analysis, we find some similarity betwixt this and the natural action.

The essential symptoms of inflammation, are redness, swelling, heat, and pain, which in some instances, are preceded, and in others, followed by a general disease. These symptoms, when taken together, differ very materially from the natural state and condition of the part; and, therefore, although they may have been produced by causes which tend to increase the natural action, yet we must consider this action as materially changed, in consequence of the morbid increase.

Although this be the case, and although many new actions do not admit of analysis, yet the different symptoms of inflammation may be explained, or the action analysed; and this I shall proceed now to do.

*Of the Ratio Symptomatum.*

*Redness.*—The redness of the inflamed part, is evidently owing to the presence of a greater quantity of blood than usual ; and this augmentation seems to be produced, both by the vessels which formerly conveyed the blood being more distended, and also, by the enlargement of the small vessels, which formerly contained only lymph, but which now receive red blood. It is the enlargement of these small vessels, which have made some suppose, that new vessels were formed by inflammation ; a supposition which is evidently contradicted, by observing, that heat, and many other causes of inflammation, operate so quickly, that no new vessel can have time to be formed ; and yet the redness is as great, and the inflammation as perfect in a minute, as in an hour or a day, after their application. The formation of a perfect and regularly organised substance, by a strongly diseased action, is likewise incompatible with the usual laws of the animal economy.

There is, likewise, another cause, which will co-operate with this, in producing that bright redness which attends many inflammations, namely, that owing to the diseased action, the arterial blood is not so thoroughly converted into venous, as in health.\* Another consequence of which, as has been formerly mentioned, is, that less life or energy is yielded to the part, and therefore it suffers more than it otherwise would do.

As the vessels are supposed to act more powerfully in inflammation, it has been thought, that they ought to contract to a greater degree ; and, therefore, ought rather to allow less

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\* This fact has been mentioned by Mr. Hunter ; but he accounts for it upon the principle of its motion being accelerated, which is certainly a mistaken view of the subject. P. 231.

blood than formerly to enter, than to become turgid. Some have, therefore, supposed, that inflammation was uniformly produced by weakness of the part ; and this idea is, in one view, adopted by Mr. Hunter, who supposes, that the muscular power of the vessels is diminished in inflammation, which, therefore, can be more fully dilated. But, certainly, the continuation of the circulation, implies a continuation of the powers which carry it on. Mr. Hunter even allows, that the blood circulates faster than usual, which cannot well happen, if the muscular power gives way. The blood is carried from the heart along all the vessels, first, by the percussive force of the heart, and next, by the contractions of the arteries, which co-operate with the original projection. Without muscular contraction in every part of the vessels, we must either suppose the heart to possess a force beyond all belief, or we must allow the circulation to proceed only a very little way ; for the amplitude of a projected body is always as the square of the impetus. Were the arteries only elastic, they could only react on the blood, and propel it onward, in a degree proportioned to the original action of the heart, and, at every inch, the velocity must become less, because the communicated force must be diminishing. Mr. Hunter, who allows both muscularity and elasticity to the arteries, admits, that the elasticity diminishes with the size, whilst the muscular power increases as the other diminishes. If, then, the muscular coat of the extreme vessels be destroyed or weakened, then the circulation must be stopped, and the part become torpid, instead of inflamed, because there is little or no elasticity to assist the circulation. Mr. Hunter likewise supposes, that, in inflammation, “the elastic power must be dilated ;” by which, I suppose, he means the elastic coat. This coat, granting it to exist in the minute vessels, must then, by this dilatation or over-stretching, be deprived of its elastic proper-

ties, and, therefore, the circulating power of the artery be still more destroyed.

Some, who have had recourse to the supposition of weakness producing inflammation, have conjectured, that the power or force of the upper part of the artery was increased, in proportion to the weakness of the extremity; and, therefore, that, by the vis a tergo, the circulation was carried on, and the part likewise became more turgid. But this goes upon the supposition, that the exciting causes of inflammation can always act more upon parts at a distance, than upon the inflamed part; and reduces the whole nearly to the old doctrine, of a part sending and a part receiving.

It must then be evident, that the muscular power of the artery continues strong and vigorous, and that the contractions are more forcible. The dilatation of the artery is proportioned to the contraction; for, unless in spasmodic diseases, the two properties of a muscle, contraction and dilatation, balance each other.\*

*Swelling.*—The swelling of an inflamed part may be ascribed to two causes; 1st. To the increased quantity of blood in the vessels; 2d. To the deposition of new matter. As the first of these has been already noticed, I shall only here attend to the second.

In every part of the body, there are two sets of vessels, (though many, for particular purposes, have more :) The one set secretes the matter which forms the parts, or deposits new organic particles† as the old ones are absorbed; the

\* It may perhaps be said, that as muscles, when inflamed, become rigid, so the muscular power of the arteries, in inflammation, ought to be diminished. But it is to be remembered, that the state of the vessels, and the state of the inflamed parts, are not exactly similar, and that the same effects are not produced in each. This must be evident. In the same way, the state of the vessels in an ulcer, and the state of the ulcer, or the condition of the vessels in any gland, and the state of the gland itself, are distinct in their effects and phenomena.

† By organic particles, I understand matter secreted or deposited in an organized state, so as to repair the waste of the body. By the same term, the Compe

other excretes a particular fluid into the interstices, betwixt the different organic particles, in order to preserve the necessary degree of softness and mobility.\* Now, it must be evident, that if the action of a part be changed, the functions of the part, and its secretions, must also be more or less affected.

In inflammation, the action is not only increased, but changed ; the secretions, therefore, are also changed, and in part increased.

The interstitial fluid (or the fluid which softens the parts) is increased in quantity, but it is also different from what it was in health : It is less perfectly prepared, (if by perfection we mean the state which was originally intended,) and approaches nearer to the nature of the lymph or serum. All the secretions are formed from the blood ; and, therefore, the less perfectly that they are formed, the nearer must they approach to the nature of the fluid from which they derive their origin.

The same cause which affects the production of the interstitial fluid, must likewise, in a certain degree, affect the formation of the new or organic particles of the part. These, in inflammation, will be deposited, like the interstitial fluid, in greater quantity, but they will likewise be less perfect ; for both the perfection and the longevity of the particles depends upon the arteries performing their functions regularly and slowly.

The swelling, then, depends, 1st. Upon the presence of a greater quantity of blood than usual ; 2dly. Upon the increase and change of the interstitial fluid ; and, 3dly. Upon

de Buffon understands molecules, which exist every where in the same form, and do not receive their organization at the part which they are to join.

\* This fluid is even to be found betwixt the particles of bone ; but it differs in them from the fluid which softens muscles, and this again from that which belongs to the brain, &c.

the deposition of more organic particles, in an imperfect state.\* The second cause operates much more than the other two; for where there is little interstitial fluid, the swelling is less.

Mr. Hunter supposes, that the swelling is chiefly produced by the extravasation of coagulable lymph, which undergoes some changes, by passing through inflamed vessels; and that this change "obliges it to coagulate" sooner than it otherwise would do.† But this operation, as he himself acknowledges, should rather retard the coagulation, than accelerate it.

*Pain.*—In the preliminary dissertation,‡ it was mentioned, that every new or imperfect action is productive of sensation in the mind,|| and it is upon this principle, that we are to account for the pain which attends inflammation. The more violent that the inflammatory action is, compared to the power of the part, or its previous state of action, the more acute is the pain. When inflammation takes place in a part, whose action naturally is small, such as cartilages and bones, or whose action, owing to the operation of other causes, ought to be very low, as, for instance, parts which have been weakened by cold, then the pain is very violent. The pain is likewise extremely acute, when parts are inflamed, which, in health, are very sensible.\*\* Hence, inflammation of the

\* Owing to this cause, and to the greater thickness of the interstitial fluid, the part feels hard.

† Hunter on Inflammation, p. 311.

‡ Preliminary Dissertation, p. 125.

|| In some rare instances, the change of action does not produce sensation, or at least, the sensation does not amount to pain. Dissection proves, that, in certain cases, inflammation has existed, and has produced suppuration, without giving any very painful sensation to the patient.

\*\* That is to say, parts which have action easily excited in them. Some parts have their action increased slowly, and with difficulty, such as tendons, bones, &c. which may be torn or broken without much pain, until the inflammatory action be slowly induced, and then the sensation is acute. If parts, whose action is

intestines is attended with violent pain. In general, the pain, in simple inflammation, is greatest during the diastole of the artery.

Some ascribed the pain to the mechanical cause of distension ; but we must ascribe it rather to the peculiar condition of the nerves, or their state of acting ; because, otherwise, we should find the pain to be in proportion to the degree of distension, which is not the case. Even the pulsatory feel, which attends inflammation, is not entirely dependent upon simple distension and contraction, but upon the peculiarity of the action ; for, in some species of inflammation, that is to say, some modifications of the inflammatory action, this sensation is not produced.

*Heat.*—Some have explained the production of animal heat entirely on mechanical or chemical principles, and have too much overlooked the agency of the living principle : But, whatever means may be employed for this purpose, we must acknowledge them to be entirely dependent on the actions of life. Common matter is capable of existing, without the aid of other matter ; but animals and vegetables, which exhibit more varied phenomena, and perform more numerous actions, depend upon other substances for their growth and support, and become afterwards, in their turn, subservient to the necessities of other individuals : They receive their increase from the conversion of other matters into a part of themselves, and have their life renewed, by changing the life of these matters into their own. Heat is likewise a principle, which is necessary to their existence ; and this also they derive from without, by processes which depend upon the presence of life. During respiration, the air, which is combined with the blood, and with some of the

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naturally low, could have it easily and quickly increased, they would become diseased from very trifling causes ; because these would readily induce an action much greater than the natural or previous action of the part.

substances which it contains, gives out part of its heat to the arterial blood, which unites with it, and from which it is again separated by the action of the living principle, in a quantity proportioned to the degree or extent of the action in general.

Those actions which, although different from the natural one, do not rise in degree or violence beyond it, produce little or no increased quantity of heat. Those actions which sink below this medium, produce less heat, and those which rise beyond it, more, than is natural.\* The production of heat is not exactly on the same footing with other secretions, which depend not so much on the degree, as on the peculiar nature of the action; for this being a simple substance, cannot be changed by the change of action, but can only be affected, with regard to quantity, by the degree of action in the vessels.†

The most current opinion, on this subject, is, that the production of animal heat, depends upon the difference in the capacity of arterial and venous blood, for combining with heat: That, in the extreme vessels, the arterial blood is combined with certain substances, in consequence of which its capacity is diminished, and heat is given out. On the other hand, when venous blood is freed from these substances in the lungs, its capacity is increased, and the heat, which is given out by the decomposition of the air which we inspire, is absorbed. But, granting all these facts to be proved, it still must be admitted by every one who reasons on the subject, that these changes cannot take place spontaneously, or of themselves, but must be dependent upon the operations of

\* By low or violent action, I mean the state of action, or its degree, considered relatively with regard to the power of the part, or to the proportion which ought to subsist betwixt action and energy.

† It is chiefly at the surface, that the action produces a variation in the degree of actual heat.

the nervous energy. It will, then, be nearer the truth, if we consider these changes rather as effects of the general operation which produces heat, than as direct causes upon which this production depends. The generation of heat in an animal, is truly a secretory process, as much as the formation of bile or gastric juice, there being only this difference betwixt them, that, in the one case, a substance is separated from the blood, which formerly existed perfectly in it, and which exists in perfection in every piece of matter, whilst, in the other, the living power produces a new combination, and different arrangement, of the principles of the blood, forming a substance which neither existed in it, nor elsewhere. Neither the one nor the other process depends upon any active changes originating in the blood itself, nor upon chemical principles alone, but both are to be referred, for their production, to the intricate and inexplicable operation of the vital energy. The production of animal heat, then, does not depend directly upon the diminution of the capacity of venous blood for combining with heat, or retaining it, more than the formation of bile depends upon the diminished ability of the blood in the liver, to retain the principles of which it consists.

The feeling of heat, then, in inflamed parts, will be great or little according to the capability of the part for producing heat, and its capability of receiving the sensation.

From these remarks, we may understand, how a greater quantity of heat is produced by an inflamed part, than that part, without acute inflammation, would produce.\* We may

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\* It must be remembered, however, that although the heat of a part be actually increased in inflammation, yet we are not to judge of the degree by the sensation which is produced; because, owing to the increased sensibility of the part, a given stimulus will produce a greater effect than formerly. Hence, the contact of a foreign body gives pain, and the presence of little more than the usual quantity of heat will give the sensation of burning. We are to judge, then, of the real de-

also understand, how, in approaching mortification, the heat is little, because the action is low, although it yet be sufficient to kill the weakened part. We can also see, why the *inflammatio assuefacta*, or what has been called passive inflammation, should produce much less heat, than the *inflammatio valida*; because the action rises little beyond the natural one, in degree, when compared to the power of the part, and has indeed become almost habitual to it.

The inflammatory action naturally terminates by a secretion, the nature of which varies in different circumstances. Whenever this takes place, then the heat of the part falls, more or less, from its morbid degree; because, although the action be still unnatural or diseased, yet its violence is less.

Even the presence of any secretion, although not dependent on disease, will prevent the heat from being raised so high, by the inflammatory action, as it otherwise would be; \* one cause of which perhaps is, that the secretion carries off a quantity of heat; another is, those parts which secrete most fluid, have least capability of producing heat.

We uniformly find, that the inflammatory action of the parts which secrete least, is attended with the production of most heat. The skin secretes less interstitial fluid than other parts; and, although it sometimes secretes perspiration profusely, yet, in inflammation, this does not take place. It is therefore, to be considered, with regard to inflammation, as one of the parts which secrete least; and, on this account, the heat is much greater in inflammation of the skin, than of other parts: But the sensation is not always greater; for, in

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gree of heat, not by the sensation of the patient, but by the feelings which it produces in another person, when he touches the inflamed part, or by the application of the thermometer.

\* Hence, inflammation of the urethra is attended with less heat than inflammation of the skin.

enterites, the sensation is very acute, owing to the nature of the part affected, or its sensibility, although the actual increase is perhaps not above one or two degrees more than its natural standard.

All increased degrees of the natural action give the sensation of heat, whether more heat be really present or not ; because the effect of heat, or increased action, is produced. The sensation, and the substance which we call heat, are two different things, the one being an effect, the other a cause ; or the one an action, and the other an agent. Now, the same effect may be produced by various causes : Thus, the application of zinc and silver, in a particular manner, to the mouth, will produce the sensation of light, as certainly as light itself. It must, however, be remembered, that, with respect to the sensation of heat, as well as other sensations, different parts have different susceptibilities. The sensation of touch is peculiarly confined to the cutis, that of hearing to the ear, &c. In the same way, some parts have a greater susceptibility for receiving the sensation called heat, than others. This sensation is strong in the skin and bowels ; but, in the brain, muscles, bones, &c. heat produces a somewhat different effect, and gives a sensation of a different nature. This is conformable to what we observe, in other instances, of the effects of foreign agents ; for there is no fact better ascertained than this, that agents often produce different effects, when applied to different individuals, or different parts of the same individual. Hence, in simple inflammation of glands, or other parts lying below the skin, with which it does not exhibit immediately the sympathy of association, we find, that there is first pain, with little heat, and then more heat, in proportion as the inflammation affects the cutis. As long as there is pain, without much heat, we may conclude, that the inflammation is not making a rapid progress toward suppuration ; for, unless in some specific inflamma-

tions, the surface always becomes affected, before matter is formed in the gland.

From these remarks, which are supported by facts, it will appear, that, in inflammation of the surface, the heat is produced in greatest quantity by the cutis, whilst the pain proper to inflammation is seated chiefly in the cellular substance.

Actual heat, in inflammation, is chiefly produced by the cuticular vessels ; and, unless these be affected, the degree of heat is not greatly increased, although, in very delicate parts, the sensation often is.\* The sensibility, with regard to heat, of the cellular substance, the muscles, the parenchymatous substance of the lungs and the liver, the substance of tendons, ligaments, brain, &c. is not great ; and, therefore, as the inflammatory action in them is not attended with the production of much actual heat, these, when inflamed, give more the sensation of simple pain, than of heat. On the other hand, the pleura, which is more sensible than those parts, with regard to heat, when inflamed, gives both the sensation of sharp pain, and also of moderate heat. The intestines, again, are, in this respect, highly sensible, and, when inflamed, give the sensation of intolerable heat, which is a pathognomonic symptom of enterites.

It is impossible to account for the variations which take place in the production of heat, by the inflammatory action, upon the mechanical principles which were once maintained, and which still are adopted by some. It was the opinion of Boerhaave,† and others,‡ who wrote after the discovery of the circulation of the blood, that the heat was produced, by the attrition of the red globules, against the sides of the ves-

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\* It has been ascertained by Mr. Hunter, that the actual heat of the muscles, or viscera, is very little increased by inflammation.

† Boerhaave, Aph. 382.

‡ Sauvage, Nosologia Method. tom. i. p. 323.

sels ; and the same is embraced by a modern author,\* as one cause of this symptom. But, by the philosophy which is now taught, it appears, that a fluid may flow with the utmost velocity, through a pipe, for a thousand years, without producing a single degree of heat : And our mechanics, regardless of the authority of either Pitcairn or Bell, seem still to believe, that, if they keep their machinery moist, there is very little danger of its being inflamed by the friction.

*Fever.*—The last of the primary symptoms of inflammation, is the general fever, or affection of the system, which often attends it. This is sometimes idiopathic ; that is to say, it sometimes is produced at the same time with the local inflammation ; and by the same causes. At other times, it is symptomatic ; that is to say, it is produced, not directly by the causes which originally produced the inflammation, but sympathetically by the local inflammation. Both of these species of fever are, in this disease, produced exactly in the same way, although by different exciting causes ; and the manner of their production may be understood, from the principles which are laid down in the preliminary dissertation. The idiopathic fever is always preceded by coldness, because the action is always formed slowly. This coldness is in the commencement real, and afterwards only sensitive. There is at first, owing to the diminution of the natural action, a diminution in the production of heat, and, consequently, a feeling of coldness. This sensation continues for some time after the actual heat, in consequence of the incipient, but imperfect action, begins to be increased, which has been attributed to a derangement in our sensitive faculty : But it may be explained in a different manner ; for, as increased action is productive of the sensation of heat, as well as frequently of the increase of actual heat, in those organs which are

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\* Bell's Treatise on Ulcers, p. 22.

peculiarly fitted to secrete it, so imperfect or diminished action is productive of the sensation of cold. During the first formation of an action, there is actual coldness produced; but, after the action has begun to take place, there is heat produced in a certain quantity; but, from the imperfection of the action, cold is still felt; because the same state which cold, or the privation of heat, produces, is present, namely, an imperfect state of action. The sympathetic, or symptomatic fever, sometimes appears to be formed without any coldness; because, from the violence of the exciting cause, or local inflammation, or the quickness of its operation, it is excited so quickly, that we do not attend to the symptoms of formation; but these, nevertheless, do take place, although, owing to this cause, their continuance be short. If, however, the local inflammation be more slowly induced, and, consequently, operate more gradually on the system, then the coldness is evidently perceived.\* The symptomatic fever, induced by scalding or burning a part, is quickly produced, and we have very little time to attend to the period of formation. On the other hand, the symptomatic fever, induced by wounds, is excited more slowly, and the period of formation is longer.

This fever is not produced by inflammation, if it affects parts only to a slight degree; but it uniformly appears, if the local inflammation be considerable, or, what is the same thing, affects very sensible parts; and, in these cases, the presence of this fever is a criterion of the presence of inflammation, in parts where we would be led to suspect it, but cannot say decidedly from other symptoms. Thus, if after lithotomy, the patient complain of pain in the abdomen, we will be led

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\* Coldness is felt not only in the whole body, if a general action be slowly induced, but it is also felt in a particular part, in local actions, if these be gradually induced. Thus, before eruptions appear on particular parts of the skin, those portions are often felt cold.

to conclude, that this proceeds from inflammation of the viscera, if it has been preceded by coldness, and accompanied with heat ; but if no shivering has taken place, and the pulse be not much affected, it proceeds most probably from a different cause.

The degree to which this fever will be excited, depends not upon the absolute quantity or violence of the inflammatory action, but in a great measure, upon the degree of the local inflammatory action, compared to the natural power and action of the part. Those parts whose action is naturally low, and, consequently, whose energy is also small, are extremely painful, when inflamed, and the system sympathises greatly with them, although the real quantity of inflammatory action, considered absolutely, be trifling. Hence, inflammation of tendons, bones, or ligaments, affect the constitution greatly ; and, from the same cause, it will appear, that agents which induce violent inflammation in joints, (by which I mean absolutely great inflammatory action,) will rapidly produce sloughs of the part, and death to the patient, in no very long time, if it be not subdued. If, on the other hand, the agents have acted less powerfully, then sloughs are not produced, but the system is as much affected as it would be by a much greater degree of local inflammatory action in some other parts. Those parts, again, which are very sensible, affect the constitution greatly, in the same way, and on the same principle nearly, as those whose action is naturally low ; because slight causes induce the same disproportionate action in them ; and hence they are soon destroyed. In this way, inflammation of the bowels affects the system greatly, and local mortification is also rapidly produced.

There is, however, another cause co-operating with this one, in the present instance, to produce a general sympathy, namely, the natural sympathy which exists betwixt the stomach and intestines, and the rest of the body, by which inju-

ries done to them affect the system very rapidly ; a slight disorder of the stomach, for instance, sometimes producing syncope. This does not depend, as Mr. Hunter\* supposes, upon the stomach being the receptacle of, what he calls, simple life ; because the existence of such a receptacle is contrary to the general nature of the animal economy ; and I know of no proofs which establish its existence.

### *Of the Consequences of Inflammation.*

Having made these remarks upon the production of the symptoms of inflammation, I shall now proceed to consider its most frequent consequences or terminations, which have generally been said to be, adhesion or resolution, suppuration, and mortification.

*Adhesion.*—To illustrate the important process of adhesion, or the union of two living parts, which have once been divided, it may not be improper to attend to the cause of reproduction in general, or the replacement of those particles which are daily absorbed. Neither absorption nor reproduction can take place in a dead body, but depend entirely on the action of the living principle. If this action be impaired, these functions are imperfectly performed. If, on the other hand, it be too high, then those processes are too rapidly car-

\* “ All the parts that may, in one sense, be called vital, do not produce the same effect upon the constitution ; and the difference seems to arise from the difference in their connections with the stomach. It is to be observed, that vital parts may be divided into two ; one, which is in itself immediately connected with life, as the stomach ; the other, where life only depends upon it in its action or use : The heart, lungs, and brain are only to be considered in this last light.”—  
“ If the stomach is inflamed, the patient feels an oppression and dejection through all the stages of the inflammation. Simple animal life seems to be hurt or lessened, just as sensation is lessened when the brain is injured.”

*Hunter on Inflammation*, p. 321, 322.

“ The stomach is the seat of simple animal life, and thereby the organ of universal sympathy of the *materia vitæ*.” P. 402.

ried on, and the new matter which is deposited, is incompletely organized; its life is likewise less perfect, and its continuance is short. This is illustrated, by what we observe in ulcers and inflamed parts. The new matter, or the organic particles, are furnished entirely by the arteries, and deposited by them, under the direction of the nerves; and the nature and organization of this matter varies with the action.\* These particles are furnished, at the moment of their formation, with the specific life of the animal, in a degree proportioned to the perfection of the formation; and their natural longevity observes the same ratio. They live and die from the same causes which influence the life of the body, considered as a whole; but their duration is infinitely shorter than that of the body. They quickly perish, or descend in the scale of existence; they are alternately absorbed and replaced. There is, thus, a continual round of death† and reproduction going forward in the animal frame.

In order that this process may go on, or that reproduction may take place, it is necessary, that a void be formed, by the absorption of the old matter; which void is filled up by new particles, which adhere together, and preserve the organization of the part. If this void, instead of being made slowly by absorption, and being filled up the moment that it is formed, be made suddenly, and of a considerable size, by incision, the same effect is, in the end, produced. The arteries which we cut, pour out their blood, but the quantity is gradually

\* The action, at the surface, forms skin, and that in the muscle, forms muscle. As long as the actions of the part remain the same, then a similar matter is furnished; but when the action changes, then the matter also changes. Thus, for instance, bone is sometimes formed in the place of membrane, &c.

† Death is the descending of any substance from a higher to a lower species of existence, or from a more perfect to a less perfect vitality; for there can be no such thing as absolute death, that is to say, complete deprivation of a vital principle, until the same Great Power who originally gave existence to matter, be pleased, by his sovereign will, to annihilate it.

diminished, until it ceases altogether, and a different and more limpid matter drops out. This has been called, by some, the lymph, and by others, the serum, which filtered through the contracting vessels. But, were this mechanical notion true, then, by varying the degree of pressure, and thus changing the diameter of the vessels, we should, at pleasure, make the discharge either red or limpid. It is more probable, that this is one of the most simple secretions which the blood yields, and that the appearance is regulated by the action of the vessels. If the edges of the wound be laid closely together, we next find, that the divided vessels, which have now become extremities, receive the action which the extremities formerly used to have, when a void was formed by absorption.\* They throw out matter nearly the same with that which was formerly yielded, and the structure of the part is restored. I have said nearly; because, from the attending circumstances, the action cannot be so perfect as formerly; and, therefore, the matter furnished will not be at first exactly the same, and the deviation will be proportioned to the degree in which the action, in consequence of the injury, is increased beyond what it was in health. Hence, in parts where the action was slow in its performance, and small in quantity, the deviation will be most. Thus, when a bone is fractured, the callus is much softer than old bone; it is formed in greater quantity than formerly, and it requires some time before it is formed in the necessary degree of perfection, to enable the person to make use of the bone. But a similar injury done to the skin, or a muscle, will not be attended with the same effects; for the action is there, in health, much quicker and much greater: The deviation is, therefore, from the first, trifling, and soon ceases.

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\* If, however, the void be larger than it ought to be, owing to the sides of the wound not being laid closely together, then this process does not take place, but the part inflames, as has been formerly explained.

Some have considered the process of adhesion in a more mechanical light, and have supposed, that the lymph was poured out, and glued the parts together, and afforded a bed, into which the vessels from the opposite surfaces might ramify, by which union was produced. This takes place, in the opinion of Mr. Hunter, owing to the vitality of the blood ; but I apprehend, that it is fully proved, that whenever blood is extravasated, it loses its animal life, and proves a stimulus to the wound, preventing it from uniting, unless the quantity be very small, in which case it is absorbed, and is thus removed. It is our great care, in surgical operations, to tie the vessels, and clear the surface from blood, in order to procure union, which ought to be attended with an effect contrary to our wishes, were adhesion to depend upon the uniting medium of the blood. Mr. Hunter likewise supposes, that coagula have the power of becoming vascular of themselves, and thus more firmly uniting the parts ; but this is assuredly ascribing the actions of one species of life, and of one body, to that of another : We might as well attribute the actions of the life of a quadruped to the living principle of the polypus.

The perceptible operations of the life of the blood are very few, and quite distinct from those of an organized animal. If it ever were to perform other actions, and assume an organized form, then it must cease to be blood, and become a substance with which we have no acquaintance ; for, hitherto, we know of no substance which can become a part of an animal, and receive a regular form, except through the intervention of the nerves and vessels, which by regular gradations, change foreign matters into part of the animal. It has, indeed, been said, that clots of blood have been injected ; but, by the same experiment, we might also prove, that a sponge, or a bit of woollen cloth, were also vascular.

Adhesion appears to be a more delicate process, than joining parts with mucus, lymph, or any intermediate substance

whatever. It appears to be nothing less than the action of that power, which is always operating in the system, and restoring the waste of the body ; but, from the circumstances under which it is exercised, and the causes which tend to make it imperfect, the substance which is thrown out is not always perfectly similar to the adjoining parts, at least in extensive wounds.

This process, which, when carried on in health, is called nutrition, has, in disease, been named the adhesive inflammation. But the term is improper; for adhesion never takes place, until inflammation subsides ; and it often is produced without any previous inflammation, and quite independent of it, without heat, without pain, and without extensive redness. Whenever a wound inflames, its lips separate, and pain is produced : When the inflammation is removed, then the parts adhere, and the pain ceases. Adhesion is, in this case, synonymous with resolution ; indeed, resolution is almost always attended with adhesion. There is, however, this difference betwixt them, that adhesion may take place without previous inflammation, whereas resolution implies the existence of that disease. If, however, inflammation has preceded adhesion, then it is exactly the same with resolution, being a termination of the inflammatory action. He, then, who would talk of the adhesive inflammation, is just as much mistaken, as he who would speak of the resolving inflammation.

In the natural state of the body, we find skin adhering to cellular substance, and this to muscle, and this again to bone ; and the same union takes place in disease, two dissimilar substances often joining together, or adhering ; but, for this purpose, it is necessary that both be alive, and that the actions of both be in a proportioned degree.

These observations on adhesion, will serve to explain the termination of inflammation, called resolution ; and, therefore, little more will be required to be said on that subject. Reso-

lution is, by some, said to be merely a cessation of inflammation, the parts returning gradually to their former state, without any intermediate condition. But, if we attend more minutely to the subject, we shall find, that the inflammatory action, like every other new action, uniformly terminates by a secretion. Some actions terminate in new secretions, whilst others only increase the quantity of old ones. When the inflammatory action subsides, we have an increased discharge of the proper secretion of the part, or interstitial fluid, which is also considerably changed in its nature, and becomes thinner than it was during the continuance of the inflammatory action.\* The part, therefore, remains swelled, until this fluid be absorbed; but the swelling is more diffused and œdematous, and the pain is gone, together with the redness. The organic particles are likewise deposited in greater perfection, and may be said to be a secretory termination of inflammation; because, during the violence of the inflammatory action, they were furnished in a very imperfect state, and were different from what they ought to be: But, when resolution is accomplished, they become again natural, and produce either adhesion, if there has been a division, or a renewal of the proper structure which has been destroyed by the inflammation, rendering the formative or nutritive action imperfect.

*Suppuration.*—If resolution do not take place, owing to the original violence of the inflammatory action, or from any other cause, then, if the part be not killed, a secretion of a different kind takes place, and the inflammation is said to terminate by suppuration.

Concerning the formation, nature, and uses of pus, many opinions have prevailed; but, by much the most universal, is founded on the ancient doctrines of fermentation. By the

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\* It is owing to this, that, during resolution, the part becomes softer, although the swelling be much the same as formerly.

Grecian physicians, pus was considered as a concoction of the blood or humours, effected by the powers of life, or by nature ; and, therefore, the state of ulcers was attended to very much by Hippocrates, in forming his prognosis, as he thus ascertained the degree of vital power, and the extent of the operations of nature. When the blood was effused into the cellular substance, then it was supposed to undergo a species of putrefaction or concoction, and to become converted into pus.\*

When the component parts of the blood came to be well understood, and when the humoural pathology came to be illustrated by experiments, attempts were made to discover which part of the blood yielded the purulent matter. From some observations on the serum of the blood, Sir John Pringle was led to believe, that pus was formed by a concoction of the serum ; for, by exposing this fluid, for some time, to a heat equal to that of the human body, a deposition was formed, bearing some distant resemblance to pus, from which it was considered as allowable to conclude, that inflammation produced an effusion of serum, and that this serum was by heat converted into pus. This opinion was keenly maintained by Mr. Gaber, who adduced many experiments similar to that just mentioned, in order to prove the doctrine. Upon these authorities, the doctrine of fermentation was adopted by Dr. Cullen, and copied from him by Mr. Bell, neither of whom seem to have remembered, that the productions which are yielded by an animal, either in health or disease, are yielded by processes peculiar to animal life, and which they cannot possibly imitate by any skill, or by the most elaborate concoction. That heat will coagulate a small portion of the serum, and make it furnish a precipitate, is a well-known

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\* "Suppurantur autem alterato sanguine ac calefacto, donec putrefactus talium ulcerum pus fiat "

*Hippoc. de Ulceribus*

fact ; but it does not thence follow, that it deposits pus. If the mere circumstances of becoming white and thick, were considered as the only necessary changes which a fluid must undergo, in order to be converted into pus, then the lymph would be a much better subject for experiment-makers to work upon, than the serum. Even the urine itself might be proved to be the source of pus ; because Sir John Pringle,\* the great authority upon this subject, allows, that this excretion, in health, yields a precipitate entirely the same with that which is furnished by the serum, and which, he supposes, is a redundant portion of the nutritious matter escaping by the kidneys. But a positive proof against this opinion of concoction, is obtained, by considering the situations in which pus is formed ; for we find it covering ulcers speedily after they have been wiped clean. Now, had pus been formed from serum, this serum could never have had time to have been digested, and it would have been absorbed by the dressings which were applied. Again, when the lungs become inflamed, in people who have water in the chest, or when enteritis is conjoined with dropsy, we find the inflamed viscera covered with pus ; but, unless inflammation has been present, we never find pus in hydrothorax or ascites alone. It must, then, in the cases where we find it, be considered as a secretion produced by inflammation, and not the result of concoction, otherwise we should find it in every case of dropsy.

Some have supposed, that pus was produced by the dissolution of the inflamed part ; but the putrefactive fermentation yields a very different product from pus : Besides, in ulcers, we daily observe an abundant flow of matter, without the smallest loss of substance.

It has been already mentioned, that the inflammatory action changes very much the nature both of the interstitial

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\* Observations, &c. p. 389.

fluid and organic particles ; and these changes may be considered as approximations toward the production of pus, if we consider this as the ultimate secretion which is to be formed. From the continuance and degree of the inflammatory action, the interstitial fluid becomes still more different from what it ought to be, and the organic particles become so imperfect, that they cannot supply the waste of the part, or renew its structure : The form of the part is then destroyed, and the cavity filled with a double secretion,\* called pus.† These observations apply to parts of a simple nature ; that is to say, parts which only form matter, to renew their loss by absorption, and interstitial fluid. But there are other parts, which have a third set of vessels, which are intended to secrete a matter not immediately subservient to the support of the part. When these parts are inflamed to such a degree, as to induce the purulent secretion, then this fluid will also be changed, and form a third component part of pus, as we observe, for instance, in the mammæ, during lactation,† if the true glandular part has suppurated. If, however, the inflammation has been less violent, then the inflamed gland still continues to yield a milky secretion ; but the milk yielded by that gland is not the same with that furnished by the rest. At other times, those third set of vessels yield the greatest

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\* Namely, the new or imperfect substance yielded by the vessels, which formerly deposited organic particles, but especially the changed interstitial fluid : These uniting, form one substance, which is called pus.

† Pus has been considered as a peculiar fluid, of a simple and homogenous nature ; but, from this doctrine, which I apprehend to be true, it will appear to be a compound body, consisting often of more secretions than one, and differing in different organs. The appellation of pus, however, is generally confined to a yellowish bland fluid, of the consistence of cream, which, like other animal secretions, contains a quantity of globules.

† If the breasts be not in a secreting state when inflamed, then they are to be considered just as the simple parts above mentioned. They are likewise, even during lactation, to be considered as simple parts, if the cellular substance alone be inflamed, as is frequently the case ; for the glandular portion does not always suffer in these cases.

part of the secretion in inflammation, as we see in the urethra; but, in this case, the inflammatory action is moderate, and the organic particles and interstitial fluid are not much affected; the first of these, at least, forming no part of the discharge, being perfect enough to remain as constituent parts of the organ.

This process takes place, in different species of inflammation, with different degrees of rapidity; and the proportion of the different substances which form pus also varies. In simple inflammation, the quickness of the process depends, in part, upon the nature of the organ affected, but chiefly upon the violence of the action. The component parts, again, depend chiefly upon the nature of the part affected, but also, in part, on the degree of action. When bones inflame and suppurate, which they do slowly, it is chiefly the interstitial fluid, in a changed state, which is furnished, the discharge being thin, and often greasy.\* Tendons yield both the interstitial fluid, and part of the organic particles, but chiefly the fluid which lubricates their surface. Muscles, the brain, parenchymatous substance of the lungs, liver, &c. and cellular substance, yield both interstitial fluid, and organic particles, in the same proportion, in equal degrees of inflammation; and the discharge is little different, to appearance, in these different parts. Lymphatic glands† yield chiefly the interstitial fluid, but also partly the organic matter, and most likely part of the lymph which they transmit. The conglomerate glands yield both the interstitial fluid and organic particles; but the latter, unless in violent inflammation, are in small quantity: They also yield their own pecu-

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\* We must distinguish betwixt the fluid which comes from the bone, and that which is furnished by the ulcer of the soft parts which cover it.

† Lymphatic glands are, in one view, to be considered as secretory organs; for they undoubtedly give out the lymph in a different state from that in which it entered them; otherwise we can perceive no use for them.

liar secretion, in an altered state. The testicles, for instance, when they suppurate, give a discharge, which consists of these three substances, but chiefly of the first, next of the last, and in least quantity the organic matter. Along with this is discharged the old substance of the testicles, (which has not been yet absorbed,) like threads. Mucous membranes, when they suppurate, yield chiefly their usual discharge, in an altered state, next the interstitial fluid, in a smaller quantity, with scarcely any organic matter, the inflammation being seldom so high as to destroy its organization.

The chills which precede extensive suppuration, or suppuration in delicate parts, are to be accounted for upon the general principle already mentioned, of every new action being preceded by symptoms of weakness during its formation. Mr. Hunter supposes, that the stomach is the great cause of those rigours, in consequence of its being "the seat of simple animal life, and thereby the organ of universal sympathy of the *materia vitæ*." It is, therefore, affected in all diseases; and the same effect is produced, as if directly injurious causes were applied to itself; which "disagreeable applications" produced coldness: But it surely does not follow, that, because whatever excites squeamishness, induces a temporary feeling of cold, therefore cold is always induced, in disease, by a similar state being excited.

The coldness which precedes suppuration, is great or little, according to the same causes which influence the degree of the cold fit which precedes inflammation, namely, the extent and degree of the action, and the delicacy of the part affected. The effect upon the system, of the purulent action, after it is fully formed, is likewise proportioned to these circumstances. Every local action, if extensive or violent, or if it exist in delicate parts, must affect the constitution, and induce a general disease. This is uniformly an affection

somewhat similar to the local action, although the symptoms be in a much less degree, and sometimes different. Thus, the local inflammatory action produces pain, heat, redness, and swelling; but the general action produces only heat, slight redness, and uneasiness, partaking rather of the nature of anxiety than pain. In the same way, the purulent action, which is a depraved action of the formative vessels of a part, produces, when it affects the system, an universal affection or derangement of these vessels, or a diseased action in them, marked by frequency of pulse, and emaciation; the function of nutrition, or the deposition of organic particles, not being properly performed.\* It is to this cause, I apprehend, and not to the mere formation of a quantity of fluid, called pus, that we are to attribute the bad effects of extensive suppuration, or ulcerations, or suppurations of the vital parts; for we cannot suppose, that weakness, or hectic fever, is induced by these abscesses or ulcers acting merely as drains, destroying a certain quantity of blood, or nutritious fluid; otherwise the effect must always be proportioned to the quantity of matter, which is not uniformly the case.

When matter is formed in a part, it is sometimes removed by absorption: The sides of the abscess are thus allowed to come together, whilst the purulent action abates, and the nutritive one returns, in consequence of which the part is again restored to its proper condition. But, more frequently, the purulent action extends toward the surface; (for all actions tend thither;) which, consequently, has its organization destroyed, the vessels of the cellular membranes and cutis forming pus; so that, at last, at some particular part where the purulent action has advanced most, the matter

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\* Hectic fever is never produced, except by such causes as affect the action of nutrition; such as the purulent action, swelling of the mesenteric glands, diabetes, &c.

comes to be covered only with the cuticle, which soon bursts, and allows the pus to escape : The abscess is then healed, in the same way as in the former instance, and both in the same way nearly as ulcers, which will be immediately illustrated ; and, therefore, I shall not explain here the mode by which abscesses are healed.

It is in consequence of the tendency of all actions to affect the surface, and approach to it, that abscesses spread outward, instead of extending laterally, or inward.\* The matter has been supposed to be prevented from spreading through the neighbouring parts, by a coat of coagulated lymph, which lined the abscess ; but it rather appears, that the whole of the inflamed part does not suppurate, but that suppuration begins first either about the centre, or rather somewhere between the centre and the external surface, leaving a hard portion below, and on every side of it : This gradually grows less ; but still the purulent action has reached the surface, before it has affected the lateral margin ; and, therefore, there is always a hardened portion surrounding the abscess, until it bursts, and for some time afterwards : But this hardened circle, or stool, as it has been called, is not formed by an effusion of lymph, induced for the purpose of confining the matter, but is the consequence of the whole of the inflamed part not having yet assumed the purulent action.

When a considerable portion of the surface has assumed the purulent action, then the abscess becomes exposed, and an ulcer is said to be formed, which is healed by the same process which heals an abscess, when it discharges its matter

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\* Mr. Hunter attributes this to absorption, produced by pressure, which acts more upon the external surface, than the sides or bottom, owing to “ a redness in the parts to be freed from a disease already existing.” The cellular substance is likewise supposed to be “ more susceptible of this irritation” than other parts, and, consequently, is more quickly absorbed.

by a small opening, or when the matter is absorbed ; namely, the natural action slowly returns, the purulent one disappearing, and the proper organic particles being again replaced.

The vessels which deposit organic particles, seem to receive their natural action first, throwing out what are called granulations, whilst the vessels which secrete interstitial fluid, are longer of receiving their proper action, and still yield a purulent discharge ; but this is not, as must be evident, exactly the same with the pus of abscesses.

Even the whole of the vessels which furnish organic particles, do not receive the action at the same time ; but one vessel after another seems to lose the purulent action, and deposit proper granulations, which, from the vascularity of the part, are soft, and of a red colour. These, from the imperfection of the action which forms them, in the beginning of the healing process, die soon, and are quickly absorbed ; but they are as speedily reproduced, and every day renders them more perfect, and brings them nearer to their natural longevity. The formative action seems, at first, to balance the absorbing action, and the part remains, to appearance, the same ; but, after a little, the granulations are formed faster than they are absorbed ; the ulcer is, therefore, filled up, and the excavation obliterated. When the ulcer is filled up to the level of the surrounding parts, or nearly so, we then find the action of increase stop, and the part remain stationary. This depends upon the original laws of the conformation of the system, by which a certain structure is, in every part, produced ; and, being once produced, has a tendency to continue. The granulations are also prevented from rising higher, by the action of the surrounding parts, of a similar nature, each portion of an organ sympathising with the rest, and having its action regulated, to a certain degree, by that of the rest. It is owing to these causes, that the granulations, in a healthy ulcer, do not shoot beyond the surface,

but become covered with skin, the skin-forming action of the neighbouring surface spreading to the ulcer, whenever it becomes nearly level with it ; that is to say, whenever it is susceptible of receiving this communication of action. The cicatrizing process begins first at the margins, both because the depth is originally less there, and, therefore, the granulations sooner rise to the proper level, and also, because they are in the immediate vicinity of the sound skin, and, consequently, have the action first communicated to them. Sometimes, indeed, the cicatrizing action is assumed by different spots, on the surface, or disk of the ulcer ; but, in this case, it is frequently diseased, an unhealthy covering being produced, which soon dies.

The cicatrix is at first thinner and softer than sound skin, and consists only of one layer, called cutis ; but, afterwards, the action becomes more perfect, and both cuticle and rete mucosum are produced. This gradation toward perfection, begins, owing to the communication of action, at the margins ; and, therefore, the cicatrix seems to grow less and less, or contract itself, owing to new circles of perfect skin being slowly formed.

When the ulcer is unhealthy, then this process of healing is interrupted, imperfect granulations are thrown out, and the cicatrizing action is also diseased, a thick insensible substance, called callus, being formed in the stead of thin cutis. The same cause which affects the formation of the granulations, affects also the discharge, which becomes different from what it was in the healthy state, being sometimes thicker, but oftener thinner.

A healthy ulcer is not attended with much pain, but rather with a kind of smarting, part of which, perhaps, may be attributed to the dressings, or other causes, acting mechanically on it : But, when the ulcer becomes unhealthy, from a change in the action, then pain is, in many cases, produced.

Suppuration and ulceration are actions complete in themselves, and quite different from the inflammatory one, being no otherwise connected with it, than as depending upon it originally for their production. Whenever an ulcer assumes the inflammatory action, then the ulcerative action subsides,\* and the suppuration lessens,† in a degree proportioned to the violence of the inflammatory action.

The ulcerative action consists of two parts, the granulating and the purulent: The first is a natural action, the last a morbid one; but these two are so connected, as to render it impossible that the one should be rendered unhealthy, without the other also being affected, both conjoined forming a perfect and distinct action, different from the inflammatory one in its nature and consequences, and different also from the suppurative one; for, in this, no granulations are formed, but the vessels which used to deposit them, secrete a fluid, or purulent matter. These actions, although distinct from each other, may yet be converted the one into the other.

The inflammatory action naturally terminates in the suppurative;‡ and this may either continue for some time stationary, and then terminate in the ulcerative, or it may continue to increase. In the first case, the superficial vessels of the abscess, or wound, throw out pus, whilst those immediately below it, retain nearly their natural action, or form organic particles. In the second case, one layer of vessels

\* The term ulcerative, does not necessarily imply a continuance of the destruction of parts, or any corroding property, otherwise these remarks would not be just; for inflammation may destroy the substance of the ulcer, and make it larger, by a species of mortification, although the ulcerative action be injured and lessened.

† This has been observed so long ago as the days of Hippocrates, who takes notice of the bad effects which follow from the inflaming of wounds in ulcers: "Ig-neum enim fervorem hoc inducit, ubi horror et pulsatio accesserit." *De Ulceribus*.

‡ The suppurative action belongs to the order Glandulares of the class Mixtæ.

after another, if I may use the expression, assumes the suppurative action, and the excavation increases, from the loss of power to form organic particles. When the suppurative action terminates in the ulcerative,\* then the vessels which used to form organic particles, regain their natural action slowly, and one after another ; whilst the other set of vessels, or those which threw out interstitial fluid, yield still purulent matter.† If the ulcerative action be perfect and healthy, then the structure of the part is slowly renewed, and the interstitial fluid of the restored part becomes natural ; the quantity of pus, therefore, gradually diminishes, its source being lessened.

If, however, from any cause, the ulcerative action should be converted into the suppurative, then granulations are no longer formed, and the part either remains stationary, or the ulcer spreads, according to circumstances.

Simple ulcers, or ulcers where there is no morbid or specific action conjoined with the ulcerative, may be divided into five genera, which consist of several species and varieties, which will be attended to in considering the cure.

First. The healthy, or healing ulcer, in which the ulcerative action exists in perfection.

Second. The indolent ulcer, in which the action is diminished, and, consequently, rendered more or less imperfect.

Third. The overacting ulcer, in which either a part, or the whole, of the ulcerative action is increased. This is divisible into two species : First, when only a part of the action is increased ; such as the granulating, forming fungus : Second, when the action, considered as a whole, is increased, and carried on with greater quickness ; in which case, the

\* The ulcerative action, when simple, belongs to the order *Ulcerautes* of the class *Mixtæ*.

† It is by the ulcerative action that all abscesses are healed, and that all loss of substance is replaced.

granulations are formed very imperfectly, and with very little longevity ; the discharge also is changed.

Fourth. The inflammatory ulcer, in which the ulcerative action is changed into the inflammatory.

Fifth. The suppurative ulcer, in which the ulcerative action is changed into the suppurative.\*

The symptoms and consequences of these changes will be attended to, when the cure comes to be considered.

It has been supposed by some, that ulcers healed rather by the circumjacent parts sinking down to the level of the bottom of the sore, than by the formation of granulations, and the renewal of the lost substance. This doctrine was particularly maintained by M. Fabre, a French surgeon, who supposes that the depth of an ulcer depends chiefly upon the swelling of the surrounding parts, and very little upon the real loss of substance ; and, therefore, that the cure must be accomplished chiefly by the subsiding of the neighbouring parts, which is produced either by amaigrissement or suppuration. When the parts have subsided as much as possible, then a cicatrix is formed, which is somewhat hollow, or concave, owing to the loss of substance, which has not been renewed ; but this hollow soon disappears, owing to the fattening of the parts below it.

This doctrine may, in part, be admitted ; for, in many cases, we observe the amaigrissement of the parts very distinctly. In all cases, it may be observed to a certain degree ; for, in every instance, a swelling at first accompanies the ulcer ; and this often, although not always, makes it appear to be deeper than the real loss of substance would occasion. In extensive ulcers in large members, we also observe, that, by

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\* These two last genera cannot properly be called ulcers, if we confine this term to parts possessed of the ulcerative action ; but if we adhere to the common acceptance of the word, or consider them merely as solutions of continuity, yielding a purulent discharge, then the division is sufficiently correct:

the emaciation of the part, the sides approach nearer together, and the ulcer is healed with less difficulty, than it otherwise would be; and we often find it useful, by proper bandages, to assist this process. But, that granulations are formed, and that they are the chief source of the healing of the ulcer, is a point established beyond all controversy, and which may be ascertained by looking at any ulcer on the tibia.

Mr. Hunter supposes, that the healing of an ulcer is much accelerated, by what he calls the "contraction of the granulations." The edges of the ulcer, he imagines, are brought nearer to each other, by the granulations contracting, like little muscles, the effect of which is increased, by some of the granulations being absorbed; in consequence of which the rest fall closer together. "Besides, the contractile power of the granulations, there is also a similar power in the surrounding edge of the cicatrizing skin, which assists the contraction of the granulations, and is generally more considerable than that of the granulations themselves, drawing the mouth of the wound together, like a purse."\*

Were granulations to contract themselves, by any muscular power, they must certainly have this process instantaneously accelerated, by the application of stimuli, and must exhibit periods of relaxation, which they are not observed to do. Were the contraction of the sore to depend upon any power of the margin to act as a sphincter, we should find, that the same cause ought to make an ulcer consequent to a crucial incision larger, and prevent it from healing so soon, or with so small a cicatrix, as it otherwise would do, which is not observed to occur. Were the contraction to depend upon interstitial absorption allowing the particles to fall nearer each other, or collapse, by the power of gravity, then it must, in its degree and effect, be regulated entirely by the perma-

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\* P. 484.

ment posture of the limb, or situation of the ulcer; for, at one time, it must make the sides fall nearer each other, and, in opposite circumstances, they must recede; but this, like the former occurrence, we do not observe.

Granulations, when new-formed, are more vascular, and more luxuriant, than afterwards; and, therefore, when they become more natural, or less spongy, they will occupy less space, and may tend, if the skin be relaxed, to bring the sides nearer together, by their condensation. The granulations, some time after they are produced, both receive less blood, and have less interstitial fluid: The interstices of the sore must, therefore, approach nearer together, and will, by the attractive power of the life which they possess, cohere more firmly together.\* They likewise possess a more perfect life than at first, and, therefore, have a more perfect union. On these accounts, the disk of the ulcer may be lessened, by the approximation of its different particles. The sides may also approach together, in extensive ulcers in large members, by the emaciation of the parts, which lessens the diameter of the limb, and, consequently, allows the skin to cover more of the ulcer.

The contraction of the superficies, dependent on the operation of these causes, is different in degree, in different instances. It is not, however, so great as it appears at first sight to be; because the cicatrix, which is first formed at the margins, is very thin and imperfect; but, in a short time, the action becomes more perfect, and the absorbed matter is replaced with skin more exactly resembling the neighbouring

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\* It has been mentioned in the preliminary dissertation, that the life of animals still retains the property termed attraction, and which belongs to the vital principle of matter, from which it is derived. It was likewise mentioned, that this property seems to be increased, by the elevation into a higher species of life. It is by this property, that the different parts adhere together; and the degree of adhesion depends upon the quantity and perfection of the life, and the proximity of the organic particles to each other.

surface. We, therefore, imagine, that the old skin is contracting, or approaching inward, whilst it is in reality the new skin which is becoming similar to the old.

The ulcerative action, chiefly perhaps in consequence of the purulent one, which makes a part of it, has a tendency to affect the constitution, and induce a general action, called hectic. The symptoms of this disease are, alternate chills and feelings of heat, accompanied by a frequent, small pulse, which is also generally at first sharp; by loss of appetite, thirst, diarrhœa, colliquative sweats through the night, emaciation of the body, with great weakness: The urine is generally pale.\* This action is always greatest at the time when the natural action is naturally lowest, namely, in the evening; and these exacerbations are generally preceded by chills; for all actions which are renewed at stated periods, or experience considerable augmentations, exhibit, in a greater or less degree, the symptoms of the period of formation. This action is dangerous, in a degree, or proves fatal with a rapidity, proportioned to the quickness with which it is induced; and hence, when, by any cause, it is speedily produced in people who previously were tolerably healthy, it often proves fatal in the course of a few days. I have known a man die within a week after opening a lumber abscess, although, at the time of the operation, he was pretty strong.

This disease has been attributed to the absorption of matter from the sore; but, when we consider, that the hectic is not produced by sores, with a certainty proportioned to their size and absorbing surface, but is dependent chiefly upon the nature of the part affected, and the specific qualities of the local action, we will be led to drop this opinion, and will rather ascribe it to an extension of the action, or a general morbid condition, induced sympathetically by it, in the me-

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\* The cheeks are also generally flushed before death.

thod already mentioned, when treating of suppuration. As a confirmation of this, it is to be remarked, that the degree and continuance of the local action, and the nature of the part affected by it, have the chief influence in producing the hectic.

The same causes which regulate the effect of the inflammatory action upon the constitution, regulate also the effect of the ulcerative action. When this action, therefore, takes place in the lungs, heart, stomach, joints, &c. then the hectic is very certainly induced. It is likewise produced by the long continuance of this action, if extensive, in parts which are less delicate, and which do not act quickly upon the system; such as the cellular substance; but it is much more readily induced in the former case, when delicate and vital parts are injured. The peculiar state of the action itself, likewise influences the production of this disease; for healthy ulceration is less apt to occasion hectic, than the diseased or unhealthy ulcerative action, although, in both cases, the same spot be affected. Hence, scrophulous ulcers affect the constitution more than many others of the same size; and hence also, the influence of the external air in producing hectic, by injuring the ulcerative action. Whenever an agent operates on any part which is not accustomed to its action, or to which it is not to be considered as a natural stimulus, then disease is produced, or the action is changed, unless the power of the agent be very inconsiderable. The air is to be considered as a natural stimulus only to the lungs and surface of the body; and, whenever it operates on any other part, it tends to injure the natural action of that part. When atmospheric air is taken into the stomach or bowels, or is blown into the cellular substance, the action of these parts is slightly injured; when introduced into the blood-vessels, a more serious evil is frequently induced. But the bad effects of the air is more clearly seen,

when the part on which it operates is previously under the influence of a diseased action. The suppurative and ulcerative actions, are merely the formative actions of the part, or its natural action rendered morbid ; and these formative actions are naturally carried on without the presence of the air, which would tend to impede them ; but it will operate still more visibly and powerfully, in changing the nature of the actions into which they are transformed by disease, rendering these actions still more imperfect and unhealthy ; that is to say, different from the condition which enables them to terminate again in the natural formative actions, by the alteration of which they were produced. When an abscess is opened, and the air thrown in, the discharge becomes thin and copious, and the healing process is interrupted. When an ulcer of the surface is exposed long to the action of the air, then it becomes foul and unhealthy.\* When an abscess of an internal part, or cavity of the body, is opened, or bursts externally, so as to allow the air to come in contact with it, then the constitution becomes affected, the hectic action is ushered in with shiverings, the appetite fails, and, although the health has been previously good, yet the patient often dies in a few days.

There are, then, three causes which tend to produce hectic : First, the existence of the suppurative or ulcerative action, in delicate or vital parts ; and this tends quickly, at least, comparatively speaking, to induce the hectic action. Second, the long continuance of the ulcerative action, to a considerable degree, in less delicate parts ; such as the cellular substance, &c. : This acts much more slowly than the other causes. Third, the specific or peculiar qualities of the action ; such as scrophulous action, or deviations consequent

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\* This change of the ulcer is not so apt to produce hectic, as a similar change of the internal ulcers or abscesses ; because the one naturally produces less effect upon the constitution than the other.

to the action of the air upon parts where it is to be considered as unnatural. The effect of the qualities will be much increased by the nature of the part affected; for the same causes operating upon ulcers of the surface, will not produce the same effect on the constitution, as when they act on ulcers of internal and vital parts. Hectic will likewise be sooner produced in those who have an irritable habit, than in those who sympathise less quickly and less easily.

The hectic fever, from whatever cause it may be induced, always exhibits certain symptoms which are essential to it, and which have been already mentioned. But, in addition to these, others may also occur, owing to the peculiarity of the cause; and perhaps no two hectic (induced by different causes) are exactly similar in every circumstance, although the difference may be such as cannot be perceived or detected. There may be, for instance, and undoubtedly is, a difference in the hectic induced by a simple ulcer, from that occasioned by a scrophulous one, or a cancerous one. I have seen the hectic, or diseased formative or nutritive action, accompanied by an emphysema, when it was induced by an abscess, which had an emphysematous action. A man had a seton passed through a tumor on the neck, but very little discharge took place immediately. In the course of four and twenty hours, the tumor yielded more fluid, which issued along with a bubbling of air; at the same time, hectic came on, and air was extricated into every part of the body. He died within two days after being taken ill; and, on opening him, I found air contained in the heart, veins, scrotum, and every cavity of the body, and through the whole cellular substance. The tumor had not the smallest communication with the trachea; and, therefore, neither the local nor general emphysema, could be attributed to the mechanical introduction of atmospheric air. Here, then, was

an instance of a peculiar modification of the hectic, owing to the peculiarity of the local action, which could be better observed than many of the less sensible qualities.

Mr. Hunter supposes, that hectic is a diseased state, induced by an incurable disease, or, “ a constitution now become affected with a local disease, or irritation, which the constitution is conscious of, and of which it cannot relieve itself, and cannot cure.”\* But, setting other arguments aside, against this opinion, we find, that, in very irritable people, abscesses sometimes produce hectic, for a week or two, which goes off when the abscess naturally heals. In consequence of this opinion, Mr. Hunter supposes, that the affection of the constitution, which takes place when a sore (as, for instance, a compound fracture,) has gone the length of forming granulations, that is to say, begins to cure, is not true hectic, but a disease, which he calls “ dissolution,” by which he means the state ushering in dissolution. But this, I apprehend, from the view which has been given of the subject, will appear often to differ, in no respect, from hectic ; only, it proves fatal sooner than this disease, in some other instances, does. At other times, indeed, the sore may induce the state of simple weakness, ushering in death, without hectic ; and, in this case, the term “ dissolution” may be sufficiently proper.

There are, therefore, two states which may be induced by inflammation, and both terminate in death ; the hectic state, and the state of simple weakness. The first is illustrated by the effect of ulceration ; the second, by the effect of inflammatory fever. It is merely the forerunner of death, and, therefore, will succeed almost every diseased action. But, although it, in most cases, precedes death, yet death does not universally succeed it ; for, as will be immediately mentioned, it

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\* P. 497.

may be induced by the sudden cessation of actions, when there is still power to recover by proper assistance.

The condition of the body immediately before death, is, I believe, generally that of simple weakness, unless when induced by mortification, or similar diseases, as will be presently mentioned. It is, at least, so far a state of simple weakness, that in most cases, the specific diseases disappear; and, could the patient be restored to strength by any power, he would, in all probability, be free from the peculiar morbid action which formerly existed.\* This weakness, as Mr. Hunter has observed, may affect one part of the body, or particular functions, less than others. On this account, the circulation is often carried on with more strength, or apparent strength, than is proportioned to the state of the system; and, therefore, death may be nearer at hand than we would imagine.

In the preliminary dissertation, it was mentioned, that all actions which subside suddenly weaken most. This state may, therefore, be quickly and unexpectedly induced, by such causes, seen or hidden, as produce a sudden diminution of the morbid action. It may, therefore, take place, although the patient be recoverable; that is to say, although the powers of life be not absolutely exhausted, or worn out.

If long continued and extensive ulceration be productive of injury to the constitution, by exciting a general action, attended with a deviation in the nutritive action, in a manner already explained, so is also, in many instances, the sudden loss or absence of this ulcerative action injurious. If the constitution have been long accustomed to this secretory action, the stoppage or cessation of it is apt to induce, in some other organ, an excretory action, although of a somewhat different kind, at least if there be any tendency to this, on ac-

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\* This is farther confirmed, by observing, that this state, when it is curable, is cured by such remedies as are used against simple weakness, and not by the remedies which we employ against the specific disease which produced it.

count of age, constitution, &c. Thus the hemorrhagic action may supervene, upon the cessation of the purulent action, and may affect either the brain, lungs, or stomach, according to circumstances; or the action of exhalation, into particular cavities, may be produced, giving rise to hydrothorax, ascites, &c. These effects, however, are less apt to be produced, if hectic have been induced by the ulcer before it was healed; because then the general action seems to diminish the tendency of particular parts to be affected. If we amputate on account of a large ulcer, the patient is more apt to become apoplectic, if he has had no considerable degree of hectic, than if this disease has made a greater progress; but, at the same time, if we have allowed it, on the other hand, to go too far, then the system cannot recover, although we remove the exciting cause, but the operation will rather tend to accelerate the death.

The bad effects of healing old sores, without proper precaution, has been attributed to the stoppage of a quantity of fluid, which produces a redundancy, or plethora; and, therefore, "adequate drains," or issues, have been proposed; But, although issues may be proper, in many cases, to prevent, by the continuance of an ulcerative action, the production of a secretory action, in more important parts, yet it does not follow, that issues act by draining off the fluids, as Mr. Bell supposes, nor that the healing of ulcers produces a plethora. If so, we must produce an issue almost as large as the old sore; at least, a small issue will do no good. We might also, by spare diet, abstinence from fluids, bleeding, purging, &c. produce the same effect with an issue, which nobody expects will be the case.

Some have supposed, that when old sores were healed, a peculiar morbid humour, which they were wont to discharge, was retained;\* but this opinion is now almost abandoned.

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\* Morgagni de Sed. et Caus. &c, Epist. LV. a. 13.

*Mortification.*—Mortification, strictly speaking, implies nothing more than merely death; but, in its general acceptance, it is made also to comprehend the putrefaction of the part which is killed; for, as the dead portion still adheres to the living, until this process takes place, the putrefactive fermentation has been always considered as synonymous with mortification, and as constituting one of its necessary symptoms. This disease, then, will be induced by whatever can kill the part, whether by subducting directly stimuli necessary for life, or by exciting an action greater than the power of the part can continue to perform. An instance of the first we have in the effects of long continued cold, compression of the arteries, &c. In those cases, the parts being deprived of necessary stimuli, die slowly, and run gradually into the putrefactive fermentation.\* This, however, only happens from the subduction of necessary stimuli, when the injuring cause is very powerful, or when some agent excites an action afterwards in the weakened parts; in which case it belongs to the next division, which is illustrated by the effects of lightning, inflammation, or whatever can increase the action beyond what the power is able to sustain.

Mortification is most likely to succeed to inflammation in four different circumstances.

First. When the inflammation is very violent and extensive, occurring in parts which were formerly healthy, and not remarkably delicate, possessing naturally a considerable degree of ac-

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\* In some rare instances, the part becomes quite dry and hard, constituting what has been called the dry gangrene, to which the epithet white has been added when the parts preserved their colour. The term gangrene, however, is here improperly applied. I have known one instance, in which the limb became cold, insensible, and quite black, but not dry. It evidently, however, was not gangrenous; because it afterwards recovered its powers, to a certain degree, and lost the black colour, becoming of a yellow tinge.

tion, as, for instance, the cellular substance, &c. Mortification more rarely takes place in this case.

Second. When the inflammatory action occurs to any considerable degree in parts where the action is naturally little, as, for instance, in tendons, &c. ; or where it ought in consequence of previous disease, to be little, as, for instance, in parts which have been weakened by cold, or in people who have had fever or palsy, &c.

Third. When the inflammatory action affects parts which are naturally very sensible, and very susceptible of having action easily induced in them, such as the intestines, the cutis, &c.

Fourth. When the inflammatory action is complicated with some other morbid condition, being produced by one of the *agentes dissimiles*, such as pestilential carbuncle, &c.\*

Mortification may, in one point of view, be compared to the natural process of the dissolution and absorption of the different parts of the body, the organic particles of which enjoy a longer or shorter life, according to the power which they originally received, and the strength and nature of the agents which operate on them. When these particles are, from the very first, weak, a small stimulus must soon destroy the little life which they possess, and their longevity will naturally be shorter, even although no disproportionate action be excited in them. The same law which prevails with regard to these particles, obtains also in the larger portions of the body ; for a degree of inflammation, easily sustained by a strong part, will destroy the same part, if it has been previously weakened. The chief difference betwixt

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\* Some gangrenous affections are epidemic, whilst others are endemic. Morgagni mentions from Brunnerus, a particular gangrene of the legs, to which the inhabitants of the Black Forest were subject, and which they were willing to attribute to the use of bad rye. *Epist. LV. a. 24.*

these processes is, that, in the one case, the particles are absorbed, and immediately replaced, whilst, in the other, from the magnitude and degree of the destruction, and the extension of the loss of all vital action, the part cannot be absorbed, but remains, and putrifies.\* Both processes likewise resemble each other, in this, that the death is dependent upon an action of the vital principle, which has this for its object. Death has been considered as merely a privation of life, or a cessation of action; but this negative state does not constitute absolute death. Death is the descending of the vital principle of one species, to the condition of that of another of a lower degree, and, therefore, must imply activity, or a state of change and conversion, referable to an action of the vital principle itself. There is, however, this intimate connexion betwixt a cessation of action, or apparent death, and real or absolute death, that when the vital principle is not employed in some other action, it has a natural tendency to assume the action of descent, or sink down to a lower species. This descent would appear to take place more or less rapidly, according to the absolute quantity of life which exists together, in the organ or part which is to die; for wherever the quantity is very small before the action of descent commences, then it takes place very quickly. Hence, when a number of organic particles are contained in any portion, and have their life strong, and in due quantity, then they retain it for a considerable time, and descend only very slowly, at the same time that they are absorbed and converted by the living power of the vessels which take them up, into a substance different

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\* When a particle dies in a healthy part, or in an action of a part, then the absorbents change it into a peculiar fluid, by an action of their vital power: But when a great number of particles die at once, in the immediate vicinity of each other, and the absorbents have their action suspended, and begin themselves to die then the part cannot be absorbed or changed into a fluid, by the vital power of the animal, but it remains, and undergoes the putrefactive fermentation, as will afterwards be mentioned.

from their former condition. But if their life be in too small quantity, or only a few insulated particles be taken to act on, then the descent takes place quickly. Hence, if we kill an animal instantly, and cut out a muscle, it will retain its animal life much longer, if the animal be healthy and strong, than if it be weak and diseased. Hence likewise, an animal will putrify soonest, if it die from the action of any of the agentes dissimiles, than from other causes ; or, in other words, the interval betwixt apparent and real death is shorter. An amputated limb of a strong man will longer exhibit contraction, by the application of the zinc and silver, than the limb of a man who labours under plague, or cynanche maligna, were amputation to be performed in these diseases ; because, in the one case, there is more real animal life remaining, at the time of cessation of evident action, or apparent death, than in the other ; and, therefore, the action of descent takes place more slowly, and real death is longer of being produced. This descent may be accelerated, after apparent death, by such causes as tend to destroy still more the remaining vitality, by exciting an action in it, although this action be not attended by contraction, or other mechanical and very evident effects. Electric shocks, heat, putrid matter, tossing about, &c. will hasten this, and induce the putrefactive fermentation, which does not take place in the solid fibre, until the descent be produced ; because no such extensive chemical changes, and new arrangements or combinations, peculiar to common matter, can take place, as long as animal life remains. But, although the muscular fibres of the muscle will not putrify, until real death take place, yet the interstitial fluid, which has less life, and consequently, dies soonest, may begin to undergo this process, before the fibres, or solid and organized part, be dead ; but, almost immediately afterwards, the whole dies ; because putrid matter tends to destroy animal life ; and, therefore, the interstitial fluid in the muscle hastens the

death of the fibre. Hence, *cæteris paribus*, the less interstitial fluid that a part has, the longer will it live ; because then one agent, tending quickly to excite universal descent of vitality, is absent.

We may, from these remarks, understand, first, why a part which dies in consequence of inflammation, should putrify much sooner than the same part, if cut out of the body in health, and kept equally hot ; because the quantity of life, before apparent death takes place, is very small : Second, why the mortification tends to spread, even independent of the continuance of its cause, or inflammation ; for the putrid matter, which is already generated, tends to excite a fatal action in the surrounding parts, and is to be considered as an *agens dissimilis*. If putrid matter be applied to a wound, that wound never heals without sloughing.

The bad effects of mortification on the system, are not to be attributed altogether immediately to the original inflammatory action, or to the fever, overpowering, as it were, the constitution ; because we often find these continue much longer, and equally violent, where no mortification takes place, without the same injury being produced. It has been already mentioned, that all local actions have a tendency, sooner or later, to extend themselves, and produce a general disease. The suppurative and ulcerative action produces hectic, in a way which has been formerly explained. In the same way, local mortification tends to induce a general and very dangerous disease, exciting that general state which we find induced by the application of putrid matter to delicate or divided parts, and inducing the tendency to the action of descent, on account of the peculiar nature of the local action.\* This general disease is also sometimes induced, by

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\* That the danger arising from mortification is owing to the sympathetic extension of the local action, and not to the absorption of putrid matter, and a general "depravation of the fluids," is evident, from this circumstance, amongst many

the action of an *agens dissimilis*, which operates on the system, at the same time that the local action is produced, and may, in this case, be said to be idiopathic. This is illustrated by *cynanche maligna*. The induction of this general state, is one great cause of the rapidity with which gangrene sometimes spreads ; because, if I may use the expression, it prepares the parts for its reception. It diminishes the quantity of life and of natural action, and tends to induce the action of descent, in every particle. Very slight causes, then, will make a number of particles die at once. Hence, the local action can spread with ease.

The local action is marked by lividity of the parts, which gradually become black ; the cuticle rises up into blisters, and an abominable smell is produced ; the mortified part is quite cold and insensible ; but the parts which are only assuming the gangrenous state, and which may still be said to be inflamed, are extremely painful, because the action is much greater than the power.

The general action is marked by great frequency and feebleness of the pulse, unusual weakness, which rapidly increases ; by thirst, squeamishness, foul tongue, and teeth covered with sordes ; heavy languid eye, and sharp anxious features. Before death, the urine and stools frequently come away involuntarily, and the patient lies in a kind of comatose slumber. At the same time, the action of descent commences, wherever the life is lowest ; and, owing to this, many of the animal excretions become fœtid. Sloughs also are formed, where the operation of foreign agents is greatest, as, for instance, where the pressure operates most, as on the

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others, that the general action is greater when the local action affects delicate parts, with which the rest of the system sympathises rapidly, than when it affects other parts, although in both cases the absorption may be supposed to be alike.

shoulders, hips, &c.\* Before death, the pulse sometimes becomes full ; but then the artery has almost lost its power, and become similar to a vein, with respect to contraction. We feel it rather moving than beating, and it is impracticable to count any regular pulsation. When this happens, it is impossible that recovery should take place.†

It has been supposed, that mortification was produced by some peculiar acrimony of the fluids,‡ or putrid ferment. Others maintain, that it is produced by the violence of the action of the vessels, which throw out red blood in place of serum ; and that, as this red blood cannot be converted into pus, it putrifies, and causes gangrene.§ But these doctrines overlook the peculiar action of the living principle, and attribute to the changes of the fluids, that which really belongs to the operations of life. The generation of putrid matter, has been too often considered as a cause, and not a consequence of disease. The humoural pathology has even been carried so far, that it has been maintained, that the blood itself might, by some causes, become putrid, and thus excite diseases. But if blood be necessary for the continuance of life, what must we think of the theory, which talks of so complete a destruction and change of this fluid, as putrefaction must produce, and yet allows that the patient lives, and supports a diseased state ! That the blood, like the rest of

\* Tulpius records an instance of universal gangrene, or mortification, which affected the whole body. *Obs. Med. Lib. III. c. 46.* Many similar instances are on record.

† In mortification, no one ever recovered from this state ; because the action of descent is then very nearly induced, and the tendency to it is so great now, that, independent of the correspondent weakness, recovery is impossible. But, when this state is induced by some other specific disease, such as fever, it is possible, though barely so, for recovery to take place ; for, in this case, the specific disease is most probably gone, and simple weakness alone remains, as has been mentioned, when treating of the prelude to dissolution.

‡ Valsalva tells us, that the serum, in a case of mortification, was so acrid, that when he tasted it, his tongue smarted for a whole day.

§ Bell on Ulcers, p. 100.

the body, may be reduced to such a state, as to putrify very quickly, after being drawn, or after apparent death, is evident, and will be easily understood, from what has already been said ; but this is very different from a putrefaction of the blood, when circulating in the living body, and a consequent disease.

*Of the Modifications of the Inflammatory Action produced by the Nature of the Affected Part.*

In the course of this dissertation, it has been mentioned, that, in many instances, the symptoms of inflammation are modified by the state of the part which it attacked. In some, the swelling is greater than in others : Some parts are much more pained, and some feel much hotter than others.

In the brain, inflammation produces simple pain, without heat, a feeling of tightness and confusion, aggravated during the diastole of the artery. The eyes are red and ferocious, or unsettled, and very sensible with respect to light. These symptoms proceed from the connexion betwixt the eye and brain, by means of the short optic nerve. The intellectual senses are impaired, and the power of supporting ourselves in an erect posture is lost. The brain is rendered redder by inflammation, and more turgid. The formation of organic particles is less affected than in many other parts ; and, therefore, the intimate structure of the inflamed part is less altered ; but still there is a change produced, the matter being tougher, and more like polypus. The terminations are either resolution, or gangrene, (in which case the portion becomes softer and thinner, and of a more dusky colour, or black, where there are membranes,) or suppuration ;\* in which

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\* If suppuration does not take place, either the interstitial or the exhalent fluid is thrown out in greater quantity, and dropsy is produced.

case, a thick yellow pus is formed, and coma is produced. If this abscess be opened, the patient sometimes recovers, and the ulcerative action commences. The granulations are red, and very vascular, which we learn, by finding them, after death, to be of a dark bloody colour. The pulse is always quickened, and becomes hard; but its condition, with respect to fullness and smallness, is uncertain.

When the eye is inflamed, the vessels become red and turgid; but the eye itself does not become larger. The sensation is partly that of a foreign body being in it, and partly of heat, or the same uneasy itchy sensation which heat produces, when it acts on the eye. The termination is generally an increased secretion of exhalent fluid.

The inflammation of the tonsil produces swelling, redness, and the sensation of simple pain, with very little heat. If, however, the action has been chiefly confined to the covering of the tonsil, or has been erysipelatous, then there is a sensation of heat and dryness. Any of the terminations may take place here; but that of gangrene is very rare in simple inflammation. When suppuration or ulceration take place, then the quantity of exhalent fluid, which is slightly changed, is increased, and the mouth is filled with a tough slaver. When the internal part suppurates, or the surface ulcerates, thick yellow pus is formed. Sometimes the superficial vessels throw out a thick yellow substance, like coagulated lymph, (owing to a slight excoriation,) producing specks. The pulse is quickened, but is not in general very hard. Sometimes it seems to be quickened, rather by the simple irritation, or pain, than by the sympathetic fever, and, in this case, it is soft.

Inflammation in the chest produces acute pain, aggravated at each inspiration. The sensation of heat is very moderate.

The terminations take place without any peculiarity.\* The pulse is hard and full, if the inflammation be moderate ; but if it be excessive, or if it occur in weak people, the pulse is smaller.

Inflammation of the trachea, urethra, nostril, &c. produces a sensation of smarting, with a slight degree of heat. The natural discharge is increased in quantity, and rendered thicker, and yellow. When this happens, the pain abates. If the inflammation be more violent, then this termination does not take place, but the parts become more turgid and painful ; the exhalent fluid, or natural discharge, is either obstructed, or is thrown out, like the interstitial fluid, thick and changed, as in other parts, forming a lining to the canal. If the inflammation be still more violent, then the organic particles also are affected, and become imperfect, or ulceration takes place.

When the stomach is inflamed, the pain is generally acute, and often of the burning kind ; whilst, from the increased sensibility of the stomach, every thing is thrown up. The pulse is small and hard : The anxiety and oppression are great. The termination which is most likely to take place, is gangrene.

Inflammation of the small intestines produces nearly the same symptoms, only the vomiting is not so excessive. The heat is always considerable, and often excruciating, as we observe in those who take arsenic. When the great intestines are inflamed, the heat is commonly less ; and, if the inflammation be slight, it is even not at all perceived. The pain, however, is acute, and generally of the lancinating kind. The pulse is frequent and hard, but not so contracted as when the small intestines are affected. The termination most frequently is gangrene, if resolution be not obtained ; but, in some

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\* Adhesion is the most frequent termination.

cases, suppuration and ulceration take place, which is seldom, if ever, the case, when the small intestines are inflamed. The intestines may also have their internal surface chiefly affected; in which case, they are similar to the urethra, &c. only the system suffers more. This is productive of a dysenteric affection, or increased discharge of thin slime, and consequently, is less dangerous than inflammation of the peritoneal covering, or of the whole substance, without this secretion. The same effects are produced in the bladder; for if its internal surface be chiefly affected, then the termination is most commonly an increased discharge of the slime; but if the whole substance be affected, then gangrene or suppuration is produced. The organic particles and interstitial fluid are more affected than in the intestines; for we find a thickening produced; and within the pores of the thickened substance, there is a gelatinous fluid, which is the changed interstitial fluid.

When bones are inflamed, the nature of the organic particles is changed, and they become much softer: The interstitial fluid is also altered, and resembles thin fat soup. When this flows out, they are said to suppurate. The pain is great.

When cartilages or tendons are inflamed, the pain is likewise great. The part swells, and becomes redder, and more opake, losing the shining appearance; and the interstitial fluid grows rather thicker. When suppuration takes place, the pain does not abate so much as in some other parts; because the action still is greater than the natural power of the part would produce. Inflammation here may also produce sloughs or gangrene.

Inflammation of membranes is also very painful: Their appearance, from the change of the nature of the organic particles, is always altered: They uniformly become thicker and more opake; and this structure they often retain, after the inflammation goes off, as we see in the lucid cornea of the eye.

When muscles are inflamed, they swell; the organic particles are in part affected; the interstitial fluid becomes thicker, and the power of motion is greatly diminished. The most frequent termination here is a secretion of the interstitial fluid, similar to that in health, but in rather greater quantity.\* If, however, the inflammation has been more violent, which seldom happens in rheumatism, owing to the diffusion of the action, then the suppurative action is produced, as we observe in wounds,† &c. The sensation is more of the wringing or pricking kind, than of heat or warmth, although there sometimes be a kind of confused sensation, or resemblance to warmth.

The peculiarities of glandular inflammation, with regard to suppuration, have been already mentioned. They have, in general, a considerable tendency to this termination; and, therefore, it is more difficult to have the inflammation resolved; but the same cause makes it almost impossible for gangrene to take place. The pain is generally pricking, or lancing, although in some particular glands, as, for instance, the testicle, it is more of the gravitating kind.

When the cellular substance is inflamed, the swelling is considerable, and the sensation chiefly that of tension, or the same as if a person were rudely handling a very delicate part; but when the cutis becomes affected, the redness is great, and the feeling of heat very acute. All the terminations of inflammation may take place in the cellular substance; but the inflammation of the cutis generally ends either in a slight discharge of perspirable matter, followed by a desquamation of the cuticle, or in gangrene.

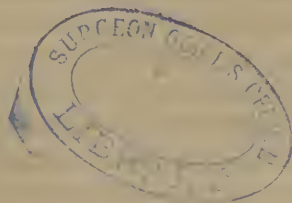
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\* When a muscle is inflamed at the time of death, we find the interstices full of a lymphatic interstitial fluid.

† Wounds likewise act by suddenly producing a void, which, as has been already mentioned, excites the purulent action, even with a very moderate degree of previous inflammation.

These modifications of simple inflammation, dependent on the nature of the part affected, are likewise affected by specific modifications of the inflammatory action itself. Some of these induce ulceration in every part indiscriminately. Some never end in suppuration. Others tend chiefly to produce mortification. Some are attended with the sensation of heat more than others, &c.

END OF VOL. I.





DISSERTATIONS  
ON  
INFLAMMATION.

VOLUME II.

CONTAINING,

DISSERT. II. CONTINUED—ON THE CURE OF SIMPLE INFLAMMATION,  
AND ITS CONSEQUENCES. DISSERT. III.—ON THE PHAGEDENIC, AND  
SOME OTHER SPECIES OF INFLAMMATION. DISSERT. IV.—ON THE  
SPONGOID INFLAMMATION. DISSERT. V.—ON THE SCROPHULOUS IN-  
FLAMMATION. DISSERT. VI.—ON THE CANCEROUS INFLAMMATION;

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BY JOHN BURNS,

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DISSERTATIONS  
ON  
INFLAMMATION.

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DISSERTATION II.

CONTINUED.

ON SIMPLE INFLAMMATION, AND ITS CONSEQUENCES.

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*Of the Cure of Inflammation.*

IN attempting the cure of inflammation, or its consequences, we must naturally be directed to the means of removal, by the nature of the action itself, and the object which we have in view. The treatment of the inflammatory action may be considered in two points of view; first, as this action consists in peculiar changes of the natural action, which changes we wish to remove; and, secondly, as this action naturally tends to disappear, and produce other actions, which require a peculiar treatment. The observations, therefore, which are to be made upon the method of cure, may be arranged under the heads of the different terminations of inflammation.

*Of the Treatment necessary to procure Resolution.*

In the treatment of most wounds, our chief intention is to prevent the accession of inflammation, and procure adhesion,

which is, in one respect, analogous to resolution. When inflammation has taken place, either in wounds, or in other cases, our great object is, to remove or lessen it as quickly as possible, which we effect, first, by removing the exciting causes of inflammation, or such causes as tend to increase the action; and, secondly, by applying such remedies as tend directly to abate the inflammatory action.

Upon the propriety of removing the exciting causes, and the manner of doing so, very little requires to be said. If any acrid, or stimulating substance, has been applied to the skin, or any extraneous body been forced into it, these must be removed before the inflammation can be resolved; because, if they be allowed to remain, they will keep up the action so long, and to such a degree, that suppuration will be produced, or gangrene, if the part be very sensible, (as, for instance, the cutis) or if the exciting cause be very irritating. Acrid substances are to be removed by ablution with water, which is in general much better than the solutions which are proposed upon the principle of chemically combining with the acrid; because these generally are likewise acrid, or stimulating, and increase still more the inflammation which has taken place, before they can combine with the substance which was formerly applied, and become neutralised. This may be illustrated by the operations of acids and alkalis. If heat have been applied, so as to induce inflammation, we must remove the superabundant quantity of heat, but must not apply cold; because we then do mischief, as will be afterwards mentioned.

When a substance is forced into the skin, so as to stimulate mechanically, we must endeavour to lay hold of it, and pull it out; but if it have penetrated so deep as to make this impracticable, we must then enlarge the wound, and remove it; because we thus may enable the wound to heal by the first intention. If, however, the injury done be great, if the part

be much bruised, or the extraneous substances be numerous, we may be less anxious about the extraction of such as require much trouble ; because the irritation which is thus given will tend to increase the degree of inflammation, and, very probably, its extent, at the same time, that from the original injury there is little prospect of adhesion being procured, or supuration prevented. We are then chiefly to search after, and extract foreign bodies, when we apprehend that their removal may permit the inflammation to be resolved, and adhesion to take place, and when we expect that their presence will excite a greater action than our endeavours to extract them will do. This is a rule which ought to be carefully remembered by every surgeon, and especially by those whose situation makes them be daily called to take the management of gunshot wounds. They are not brought to their patient to show how much they can do in the way of cutting and probing ; it is their duty to administer relief, and act so as to prevent and abate the inflammatory action, which they will often do most effectually by letting their patient alone, and throwing aside their ball-screws and forceps.

The circumstance of being in an unusual situation, in which the natural action cannot possibly be continued, is also a very frequent cause, producing inflammation, and preventing its resolution. We ought, upon this principle, which has been formerly mentioned, to endeavour, in almost every instance, to bring the sides of the wound together, if a wound has been the exciting cause of inflammation, by which we shall much more readily prevent or overcome the inflammatory action ; because we thus bring the parts nearly to their natural situation, with respect to interstice, and thus make the organic particles be more readily thrown out.\* This

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\* Bringing two surfaces in contact, although they naturally were not so, will have the same effect. Thus, if the skin be taken off the edges of our fingers, and the

practice ought to be pushed farther than is often done. Even in many contused wounds it will be useful ; because, although union may not be immediately produced, yet, when the contused part is either recovered, or absorbed, the inflammatory action may be prevented, or removed, by the restoration of the natural action, if the part be in absolute contact. It must, however, be remembered, that if much difficulty be experienced in bringing and retaining the parts together, owing to the swelling, from the previous existence of the diseased action, then our endeavour will be hurtful ; because the irritation which we thus give, has a greater power to increase the action, than the circumstance of the parts being in contact, has to diminish the inflammation, and restore the natural action.

By removing, then, the exciting causes of inflammation, before the action be induced, we shall frequently prevent it altogether from being formed ; but, even although we should be disappointed, we, by this removal, render the disease milder, less extensive, and much more easily overcome ; for, as long as the exciting causes continue to operate, it is impossible to procure resolution ; but the action will be kept up until some other termination, or consequence, be induced. But, although we thus prevent the action from being raised to so great a degree as it otherwise would be, yet we do not immediately overcome or destroy it ; because the action, when once induced, has, like every other action, a tendency to continue for some time after its cause is withdrawn. This

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side of the one be applied to the side of the other, adhesion will take place, and no inflammation will be produced. When a part is inflamed, and one portion is brought in contact with another, we uniformly find, that the inflammation is less where the parts were in contact than elsewhere. Thus, when the intestines are inflamed, the parts suffer least which touch other intestines, whilst the angle betwixt the folds is most affected. This fact is observed by Mr. Hunter, but explained upon the principle of contiguous sympathy ; or, “ a mutual harmony being produced, which prevents their being inflamed.”

continuance may be longer or shorter, according to circumstances, and its termination may be more or less unfavourable. We are, therefore, under the necessity of employing such remedies as have a power of directly diminishing or removing this action. It has, however, been doubted, whether they ought, in every instance, to be employed; or, in other words, whether resolution ought uniformly to be desired. It has, for instance, been deemed unsafe to check those inflammations which depended upon a general or constitutional specific disease, or occurred during its existence. But this opinion, which was evidently founded upon the supposition of the operation of morbid humours, cannot be maintained, now that this is given up. Granting inflammation, in every one of these cases, to be dependent upon the general disease, and to exist as a symptom of it, no harm can accrue from resolving it;\* because, if the inflammation have once taken place, the full effect of the general disease is produced, which, therefore, cannot be affected by the peculiarity of the termination of this inflammation, unless it be proved, that some humour be sent there to be concocted and thrown out. In many instances, inflammation occurs in a general disease, merely as an accidental circumstance; but, even in those cases where the local inflammation is most decidedly dependent on the general action, and is perhaps essential to it, we find, that no bad effects follow from resolving the inflammation; and, if this be the case with regard to specific inflammation, we may still more certainly extend the principle to the treatment of the simple inflammatory action, with which we have at present a more immediate connexion. There are, however, some inflammatory affections which we sometimes cannot put back; such as those tumors which succeed

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\* If we attempt, without fear, to cure the general disease, why may we not also endeavour to hasten the termination of the local disease?

the small-pox ; but, when we do succeed, no bad consequence follows ; and the failure of some of our attempts can be no argument against the general plan, more than our failure in many other instances.

Resolution is the quickest termination of inflammation, and, therefore, ought, perhaps in every instance, to be attempted, unless in cases where the injury is such that suppuration is unavoidable ; as, for instance, extensive bruises, &c. It is our great object, even in those inflammations which we raise intentionally ; as, for instance, in the operation for hydrocele. At one time, however, this was not admitted without limitation ; and suppuration was, in many instances, anxiously sought for, being considered by some as the only way of obtaining a cure. “ Union, (says Mr. O’Halloran) without suppuration, by an immediate coalescence, or by the first intention, is merely chimerical, and is opposite to the rules of nature. Inflammation (contrary to the received canon) is not the time for a re-union of divided parts : This happy minute follows, not precedes suppuration.” It was timidity, with regard to the prevention of suppuration, and want of knowledge of the powers of the animal frame, which so long retarded the progress of surgery, and prevented the improvement of its operations.

The remedies which we employ, with the intention of abating and removing the inflammatory action, are either general or topical.

General remedies are perhaps only useful, or have only a superiority over topical ones, when a general disease, or fever, accompanies the local inflammation. Topical ones are only to be trusted to alone, when the disease is entirely local.

The general remedies, are naturally such as tend to abate action in general, or to diminish the natural action ; and therefore, will consist of bleeding, cold, purging, sweating, nauseating medicines, and some of the *agentes dissimiles*.

Bleeding is justly considered as the most powerful, and the most useful of all those remedies ; and, in many cases, is the only one which can accomplish a cure. The quantity of blood which it is necessary to detract, will be regulated by the effect of the inflammation upon the system, and by the previous condition of the person, with regard to strength ; for those who are weak bear bleeding worst ; and in them we cannot repeat it so frequently, as in the robust. Delay in them is, however, more dangerous ; because the inflammation makes a more rapid progress, and, therefore, we ought sooner to push our remedies.

When the system is affected, in consequence of inflammation of vital parts, the general action is greater than when other parts are affected, and, therefore, bleeding must be used earlier, and with more freedom. Mr. Hunter observes, that when these parts are inflamed, the patient bears bleeding worse than when parts are affected which are not vital : but this observation must not be admitted indefinitely. When these parts are affected, the action is so violent, that the power cannot long support it ; and, therefore, we must have early recourse to the lancet, and allow the blood to flow until the pain diminishes, and ceases to abate any more, and until the pulse becomes softer, and perhaps fuller. This is the time to stop ; but, whenever the pain returns, or the pulse becomes hard, the orifice should be again opened, although we had bled only half an hour before. The system, in this way, is not weakened, nor the action sunk so low as to injure the power of recovery, which might be the case, were we to bleed too copiously at once. This remark applies, in a particular degree, to inflammation of the bowels ; but it may also be extended to pulmonic inflammation ; only, in this case, we can detract more blood at a time than in the other instance ; because the system sympathises less strongly with the lungs, and, therefore, general evacuation will be longer

of operating on the local disease. The same cause, however, makes the danger less ; because the general action is not raised so high, and the part itself not being so delicate, can support the action longer, and, consequently, the danger is less. It is an established point, that no action can subside, or be destroyed suddenly, and the patient become free from disease. All morbid actions must subside, more or less slowly, and, therefore, bleeding ought not at once to be pushed so far as to produce fainting, unless the patient be very liable to faint. This sudden cessation of general action does not destroy the specific nature of the action which is going on when it is induced, but rather leaves the parts stationary, the tendency to morbid action still continuing, although the capability to act be suspended for a moment.\* In place, then, of bleeding so as to exhaust the strength quickly, and endeavour, as it were, by the quantity of the discharge, to destroy the disease by one bleeding, it will be much better to bleed just until we produce the feeling of weakness to a moderate extent, and abate, to a certain degree, the pain and hardness of the pulse ; stopping, whenever we find that we are not abating it farther, distinguishing, however, betwixt real abatement and syncope, or want of power to act and feel. We then repeat the evacuation, whenever the hardness of the pulse and pain return ; and thus, perhaps in one day, and with infinitely more benefit, bleed much more frequently, and, perhaps, to a greater extent, than is sometimes done in a week, by those who bleed more copiously at once, and repeat it seldom.

Concerning the exact quantity of blood, which ought, in the different varieties of inflammation, to be detracted, I hold it, from the above principle, to be ridiculous to give any di-

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\* When we are obliged to stop our bleeding, on account of fainting, before we would otherwise do it, we will find it necessary to repeat the venesection sooner than if this did not happen.

rection; because no general rule can be given, by which we may, *a priori*, determine the quantity. We are to bleed until we procure an abatement of the action; and to stop whenever this abatement ceases to be really progressive.\* We are to renew the bleeding, whenever the action again increases, and stop, as before, whenever it is abated, remembering, that, after some time, a more sparing detraction will produce a greater effect, than a more copious one would do, in the commencement of the disease. It must also be attended to, that, owing to the weakness induced by the disease, and by the bleedings, we must, toward the end, bleed at longer intervals; for, if we continue to bleed in the same way as formerly, we would either kill the patient, or at least prevent the act of restoration from taking place; because we would thus diminish the power, or vital energy, which was to perform this act. Those, then, who order a certain number of ounces to be taken away, must reason upon probability, and prescribe less efficaciously, than those who direct no determinate quantity, but regulate their practice by the effects. It is equally foolish in those who order bleeding, *pro viribus*, and are satisfied with this until their next stated visit; because bleeding until fainting takes place, and not repeating it for some time afterwards, may be doing a great deal too little.

As there is a proper time for stopping each individual evacuation, so also is there a period at which we ought to stop the general plan of cure by bleeding, or at least to intermit it. And to determine when this period is come, is sometimes a pretty nice point, and one of much importance; because, if we stop too soon, we allow the action still to go on, and, per-

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\* We must distinguish, as has been already mentioned, betwixt a real abatement of the inflammatory action, and a mere temporary suspension of action, or syncope.

haps, to terminate fatally. On the other hand, if we bleed too long, we sink the parts below the state necessary for recovery, and even accelerate the unfavourable termination. When, for instance, from the state of the pulse, and other circumstances, we apprehend the accession of gangrene, bleeding will not abate pain, but will bring on the mortification sooner, and make it spread farther, as will be afterwards mentioned.

As the accession of inflammation depends upon a change of the natural action of the vital principle, so does its removal depend upon the reconversion of this into the natural action, which implies activity, or an active state. If, then, we bleed in the end of inflammation, we lessen the powers of the part so much, as to prevent restoration; gangrene, therefore, will take place: Or, if the part be less delicate, and the progress of the action consequently slower, the inflammation may continue stationary for a considerable time, and become chronic, or habitual. This state is not to be cured by bleeding, but will rather be made worse by it. Whenever, then, after inflammation has continued for a length of time, we find, that venesection does not produce the usual abatement; or, whenever, although there be a temporary abatement, the pain increases afterwards to a greater degree, we may be certain our treatment is improper. We likewise find, that the longer bleeding has been delayed, in the beginning of the disease, the sooner must we stop, and the less quantity must we take at a time; because, in this case, the inflammatory action is nearer its termination, and is more ready to produce gangrene, if the parts be delicate, or the action great, or, if otherwise, the inflammation assuefacta. We are also to refrain from bleeding, when we find that the inflammatory action is about to terminate in another action; as, for instance, the suppurative; because, in the first place, bleeding, in this new action, can do no good, but, by weaken-

ing, will do harm ; and, secondly, if there be only a tendency to this action, the action not being yet formed, or beginning to form, we may, by bleeding, interrupt the progress of the inflammation, and convert it into a more tedious disease, or the inflammatio assuefacta.

Bleeding has been used, not only as a cure for inflammation, but also as a preventive ; but this must be considered as proper, only in particular instances. When, for instance, a wound has been inflicted, or an operation necessarily performed, on a robust person, bleeding immediately, or very soon after it, may be useful ; because it will tend to lessen the chance of the natural action being carried so high as to become changed. These people cannot have their action much increased without disease ; and, therefore, it is necessary to lessen it, and bring it down to a more proper medium. But there are other cases, where the action is naturally rather too low, and the patient weakly. In these cases, bleeding can do no good, but much harm ; because it increases the previous weakness, and makes the inflammation, if it does occur, more dangerous, on account of the little power which there is to support the action. These people even bear bleeding worse than others, when inflammation has actually taken place. It ought never to be practised, in order to reduce the natural action, before disease has taken place ; and, after the inflammatory action is induced, it ought to be used cautiously, and only to such an extent, as may be necessary for removing the tendency to immediate bad consequences. It ought, however, to be used very early in the disease ; because, in weak people, the action does more harm in a given time, than in the strong ; but it ought likewise to be sooner abandoned, otherwise we either hasten mortification, or prevent the act of restoration from taking place.

Bleeding is rarely necessary in inflammation of the cellular substance alone, unless the action be extensive ; in which case, the system is so affected, as to require our interference. When the cutis is inflamed, producing erysipelas, the system suffers considerably ; but, as this frequently ends in mortification, bleeding has been neglected by many ; but it is evident, that, if the disease be simple, and not dependent upon any specific agens dissimilis, or epidemic contagion, venesection is the proper cure, provided it be early employed, as we thus diminish the action more certainly than by any other means. If, however, the disease have been neglected, and the action be nearer a termination, then we must either do nothing in the way of general treatment, or must give opposite remedies from bleeding, according to circumstances. When muscles are inflamed, bleeding is often necessary to a very great extent, as we observe in rheumatism ; and, in the beginning, we must take a greater quantity at a time, in order to procure an abatement, than in many other cases. When the viscera are inflamed, bleeding is uniformly necessary, and generally requires to be frequently repeated.

It is a common opinion, that the blood ought to be taken, if possible, from a vein which arises from, or near the affected part ; that, for instance, in phrenites, we should bleed in the jugular vein ; in inflammation of the feet, we should bleed in the leg, &c. And, when this can conveniently be done, it may be preferred ; because, it not only possesses all the advantages of general bleeding from any other vein, but also may be supposed to produce, in a slight degree, a topical evacuation. If, however, the veins be so small, that we cannot detract enough of blood, and sufficiently quick ; or if, from any other cause, we cannot do so, then, if the general action be violent, we must have recourse to another vein, as the loss to be sustained, by confining ourselves to this vein,

is infinitely greater, than any good which can be derived from it, as a local evacuation. Indeed, when we consider the laws of the circulation, we must allow, that very little good can be done in this way, as a local detraction; because one vein does not lose more blood than another, except during the moment of the flow.

The blood, when drawn during inflammation, has always a buffy coat, which is, in general, thicker, and more concave, in proportion to the violence of the inflammatory action; and the continuance of this condition, is one circumstance which points out the necessity of continuing our evacuation: But the mere existence of a buffy crust, is not, without these circumstances, any infallible sign of the necessity of bleeding; because this crust is to be found on the blood, after the inflammation has begun to become passive; and it is to be found also, when mortification is approaching; we observe it likewise very frequently upon the last cup of blood which we find it necessary to take away. In these cases, however, the crust is much softer, generally thinner, always flat, instead of concave, and looser in the texture; it is also more of a greenish hue. These circumstances, conjoined with the state of the pulse, will enable us to judge, whether we should totally desist from, or continue our evacuations with caution. Most frequently they forbid farther bleeding.

Cold, or the subduction of heat, is chiefly useful as a topical application; but it is also proper to be applied, in moderation, for the abatement of the general fever, unless we be desirous of procuring perspiration. The quantity of bed-clothes ought to be lessened, cold drink should be allowed, and a free circulation of cool air into the room. The application of cold, however, ought, in general, only to be carried to such an extent as shall be sufficient for diminishing the morbid degree of heat, and not so far as to produce sensible cold, or the sensation of cold; because this, in many instan-

ces, will be pernicious, upon the principle of the sympathy of equilibrium, the action of the internal parts being increased by the speedy application of cold to the surface; and, therefore, if the internal parts be inflamed, their morbid action must be still farther increased. If the cold be long applied, to any considerable degree, it will likewise, by the sympathy of association, weaken the whole system too much, and injure the act of restoration. As bleeding is to be used only until it restores a natural state, and abates pain, so also is cold only to be applied in such a degree as may be necessary for diminishing the preternatural heat, and sensation of the surface; which it does, by lessening the morbidly increased action, and reducing it to the natural state. The degree must therefore gradually be diminished, in proportion as the general disease subsides, otherwise we injure the system, and prevent recovery. There is, however, this difference betwixt bleeding and the application of cold, that the first may be used suddenly, and to a considerable extent at once, whereas, the second ought, especially in all cases of internal inflammation, to be employed more slowly, and its degree regulated by the degree of the general heat of the surface.

Nauseating medicines are also very useful, independently of the sweating which they frequently induce; and are a very powerful mean of abating action in general.\* Employed, after bleeding has been used once or twice, they are productive of considerable benefit; but there are some affections, in which they cannot be used, such as inflammation of the stomach and intestines; but in inflammation of the lungs, of the throat, muscles, or surface, they may often be prescribed with benefit. The remedies usually employed for this purpose, are, small doses of emetics, given without drink.

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\* Nausea has often been employed with success, in checking active hemorrhage.

It must, however, be remembered, that these frequently produce considerable evacuations, either from the skin or bowels, and, therefore, may occasion a permanent weakness. We must likewise avoid raising the sickness to a great degree, and keeping it long up; because the same objection applies nearly to this as to bleeding *ad deliquium*.

Purging is frequently employed in the cure of inflammation, especially such purgatives as are called cooling, which, in this case, is an imaginary quality; but, unless in so far as they tend to abate the irritation of costiveness, they can do no more than bleeding can, and are, in many respects, inferior to it. They are, in one view, to be compared with the application of cold, which is only indicated when there is much heat; both are intended to diminish action, chiefly by removing stimuli from the part to which they are applied. Purging is very uncertain in the effects which it produces on the system, and in the degree of weakness which it causes; and, therefore, never can be put in competition with bleeding, as a general remedy; and, wherever bleeding is improper, or its propriety doubtful, purgatives are still more injurious. They operate likewise so slowly, at least comparatively speaking, that they do not influence the local action so much, as the loss of such a quantity of blood, as would produce an equal effect on the body, will do, unless in particular cases, when they act upon the principle of the sympathy of equilibrium; as, for instance, in pulmonic inflammation, when they sometimes are of service, by increasing the action of the intestines, and diminishing that of the lungs.\* In the same way, emetics sometimes cure slight inflammation of the tonsils. One of the best and pleasantest saline purgatives, is the phosphate of soda, which may be given to an adult in the dose of an ounce, in order to obviate the ef-

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\* This action is, in this respect, similar to that of blisters.

fects of costiveness. If we wish to use it, upon the principle of the sympathy of equilibrium, we must give two ounces, or more. The same cautions which were given, with regard to bleeding, apply also to purging.

Sweating, considered as a mean of abating general action, is, in most cases, inferior to bleeding; and can never, when the general inflammatory action is considerable, be trusted to alone; but, after the use of the lancet, it is generally serviceable. It is useful, in particular, when the local disease is not confined to a small spot, but affects a considerable surface, or different parts of the body; as, for instance, in the rheumatism; but it acts, in these cases, rather by the sympathy of equilibrium, than by any other mode. At the same time, the induction of a sweat, preceded by bleeding, (which tends to abate the local action as well as the general one) will sometimes be useful, by giving a secretory termination to the general disease, and hastening its conclusion. In the first point of view, sweating may be used early in the disease, especially if preceded by bleeding. In the second, it will be chiefly useful toward the end, as it will then accelerate the termination, and thus influence the local action; for the abatement of the general action must also produce an abatement of the action of a particular part. Sweating, as well as purging, must be used with caution in weakly people, or in those who are reduced by disease; because, although the action of particular parts may be increased by it, yet, partly in consequence of this temporary increase, and partly on account of the fluid which is discharged, general weakness is induced. One of the best sudorifics is the *pulvis ipecacuanhæ comp.*; of which we may give ten grains every hour, until sweating be produced, giving warm lemonade along with it. The tartar emetic is also a very useful

sudorific ; the sixth part of a grain may be given every half hour, until the proper effect be produced.\*

Some of the agentes dissimiles may be considered as proper remedies in this complaint ; such as, digitalis, laurel water, lead, &c. : But they are certainly inferior to blood-letting ; and have been so little employed in this way, that their effects are not ascertained.†

Bleeding, of all the general remedies, is the best ; and, next to that, cold, and nausea, which may be considered as useful adjuvants. Sweating and purging are mostly to be used when particular indications present themselves, as may be understood from what has been already said. The first of these remedies, act chiefly by producing a universal abatement of action ; and, of these, bleeding produces the most permanent effect on the body, and the most certain effect on the local disease. The two last are perhaps more useful, upon the principle of the sympathy of equilibrium, than that of abating action in general, which is only a secondary operation ; and, therefore, they may be considered as remedies, acting rather topically than generally ; for, according to this view, they act chiefly on the affected part. These two kinds of remedies may, in many cases, be usefully conjoined, producing thus a greater effect than either would do singly.

Before quitting this subject, it may not be improper to attend to the proposal which has been made, of exhibiting anodynes immediately after bleeding, in order to remove the pain. “ The most effectual remedy for this purpose, (says Mr. Bell) is opium, which, when pain and irritation are con-

\* One grain of emetic tartar may be dissolved in five ounces of saline julep, and a table spoonful given every half hour, as long as may be necessary.

† Some of these agents might perhaps only change the nature of the inflammation, and render it specific,

considerable, as in extensive inflammations very frequently happens, should never be omitted. In large wounds, especially after amputations, and other capital operations, in punctures of all kinds too, large doses of opium are always attended with remarkably good effects. In all such cases, however, opium, in order to have a proper influence, should, as we have observed, be administered in full doses, otherwise, instead of proving serviceable, it seems rather to have the contrary effect; a circumstance which is perhaps the chief reason why opiates in general have been very unjustly condemned, in every case of inflammation.\* That, in every case of inflammation, opiates are hurtful, is what no one can assert; and their utility will afterwards be fully manifested. But, that opium is useful, or even harmless, in the *inflammatio valida*, which we are at present considering, cannot be admitted; because daily experience, independent of every theory, proves, that, by their use, the general fever is increased, and the local action aggravated. Even given as a preventive of inflammation, after operations, anodynes are almost uniformly hurtful,\* producing restlessness, heat, and thirst, and afterwards head-ache, sickness, and frequently troublesome vomiting. I have therefore now, after almost every operation, laid aside their use, and find, that the diseased action,† subsequent to the local irritation, runs its progress with much less disturbance, and is much milder,

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\* Opiates may indeed abate the smarting, or soreness, which is consequent to the immediate mechanical injury of wounds, or operations; but this relief is commonly only temporary; for the general action is very apt to be afterwards increased, and, consequently, union by adhesion is less likely to take place.

† There are two general diseases which are connected with local actions, and which opium is supposed to cure, or prevent from taking place; the inflammatory fever, dependent on a wound, and the febrile state, consequent to a temporary increased action, or exertion of a particular part, or the whole of the system; as, for instance, the effect of parturition. The first of these is always aggravated by opium; the second, if it be not increased, cannot possibly be cured by it.

and shorter, than where anodynes have been administered; and, in general, the sleep is much more composed, and always more refreshing. I have therefore, after lithotomy, amputation, the extirpation of the mammæ, and after labours, in almost every instance, omitted them.

The local applications are such as tend either simply to abate action in the part, or such as tend to change its nature, by exciting a specific change, or such as act in both ways. The first comprehends cold, the second the *agentes dissimiles*, and the third topical bleeding.

Cold, applied directly to the inflamed part, is a most useful remedy, diminishing the action to a natural state; but, for this purpose, it must not be applied in too great a degree, otherwise we diminish the action so much, and so suddenly, (and, consequently, the power of the part) that recovery cannot take place. If we apply much cold to a healthy part, we sink its action so far, that it is irrecoverable; if we apply cold to an inflamed part, so as to diminish its action equally sudden, and in the same proportion, we produce the same effect. Poultices of ice, or snow, are therefore highly dangerous; and even water, although it cannot be made nearly so cold as these. The same direction which has been given, with regard to the application of cold as a general remedy, ought also to be remembered, when we use it as a local application, namely, it ought to be carried just to such a degree, as shall diminish the morbid sensation, and ought to be so adjusted, as to keep the part nearly in its natural degree, or at least very little lower. For this purpose, it must be applied in moderation, repeatedly, and with assiduity; and not, as is commonly done, in a considerable degree at once, and renewed only at long intervals. Cold has been supposed to be useful as an active astringent, producing a contraction in the vessels; but it does not seem to possess any active power in producing such a state in the vessels to

which it is applied. Where injury is taking place, from excessive action, cold, by abating it, may strengthen, and produce more natural contractions; but, when applied to a healthy part, it diminishes the action of that part, the blood is less forcibly circulated, and the part shrinks; it therefore stops active hemorrhage in the part on which it acts. When cold is applied suddenly, or to delicate parts, it excites an universal action, or contraction, or shrinking, from weakness; and, therefore may likewise stop hemorrhage from distant parts. In many cases, when this shrinking, or temporary contraction, is suddenly induced by cold, it becomes converted into the natural muscular contraction of the part; thus, for instance, if cold be applied to the uterus itself,\* when torpid, after delivery, we find, that after the first effect, or shrinking of the vessels, a more natural contraction takes place. If, however, cold be long applied, we find, that the contraction thus induced ceases, owing to the diminution of action which is occasioned by its continuance, and the original state of collapse, or shrinking, alone remains.

Blisters likewise act by simply abating the action of the part; but differ from cold, in requiring to be applied, not to the part which is affected, but to some other, with which it exhibits the sympathy of equilibrium; as, for instance, to the integuments of the thorax, in pulmonic inflammation; to the skin of the knee, in affections of the joint, &c. It is, however, necessary, when a general disease, or fever, is induced, that bleeding be fully employed, before we have recourse to blistering; because, if it be not, the inflammation excited by the blister, co-operates to increase the fever, along with the original disease, which it has not had time to overcome, or lessen. Blistering likewise acts more effectually

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\* When applied to the skin of the abdomen, it acts chiefly by exciting action, on the principle of the sympathy of equilibrium.

ally, when the local action has been already diminished, by previous bleeding. The size of the blister should be proportioned to the probable extent of the diseased action ; at the same time, we must set bounds to this magnitude ; because, if too large, they may not only produce, or keep up a general disease, but also, by lessening the action of the internal parts too much, and too quickly, they may prevent recovery.\* It is therefore better to apply them of a moderate size, and renew them frequently, than to apply one too large at once. It must, however, be remembered, that inflammations of every part are not equally readily overcome in this way ; and, therefore, one will require a larger blister than another ; thus, the same quantity of inflammatory action in the brain, will be more difficultly subdued, than in the breast ; and, therefore, we must apply, in that case, a larger blister. As it is the inflammatory action, induced by the blister, and not the discharge, as was once supposed, which is useful, it follows, that the same blistered place should not be kept too long from healing, or in the state of an issue, but that we ought rather to apply a succession of blisters ; and this succession should be pretty rapid. There is indeed one case, in which issues are admissible, namely, where, from the nature of the inflamed part, or the peculiarity of the inflammation, if it be specific, or scrophulous, the progress of the action is very slow. In these cases, a rapid, and continued succession of blister would, doubtless, be most useful, but, from the duration of the treatment, would scarcely be submitted to : Issues, which are less painful, and less troublesome, are, therefore, generally preferred. We have an instance of this in many diseased joints.

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\* Were this not the case, we should cure pulmonic inflammation, with the greatest certainty, by covering the whole thorax with a blister.

The remedies which tend to diminish the inflammatory action, by producing a peculiar, or specific change, are, the *agentes dissimiles*, of which, for this purpose, lead is the best, and the one which is most frequently employed. Lead, in the state of an oxyde, was long ago used ; but it does not appear, in this condition, to have much activity ; and, therefore, the saline preparations are now introduced into use. The acetite of lead, on account of the supposed power of vegetable acids in abating inflammation, has been considered as possessing a great superiority over other forms ; but its chief recommendation over other soluble preparations, is its cheapness ; for the nitrate of lead seems to be equally powerful. The acetite of lead may be employed, either before or after crystallisation ; but, if we use the crystals, they must be redissolved ; for which purpose, soft, or distilled water, must be employed, otherwise a decomposition takes place. The strength of the solution which we apply, must be determined by the natural delicacy of the part, and its morbid sensibility, in consequence of inflammation. In the *inflammatio valida*, in which alone it is proper, the solution never ought to be so strong as to produce pain. When the eye, urethra, and other delicate parts, are inflamed, the application ought to be just so strong as to produce sensation, and should be very frequently repeated. When the *œllular* substance is inflamed, and we begin the application before the cutis be much affected, the solution will not require to be so strong as to produce sensation ; because, were it to be so, the action excited might, from the quantity required to produce the effect, be so great, and so suddenly induced, that the powers of recovery would be lost, or a specific inflammation be occasioned, as we observe, when the solution is very much concentrated, in which case, even sloughs are sometimes produced. On the same account, we must renew the application frequently, at least if we use pledgets, other-

wise the evaporation of the solvent increases the strength more than we desire. For incipient phlegmon, we may employ a solution consisting of three pounds of rain or river water, and five drachms of sugar of lead; or the following, which is more elegant :

R. Cerussa Acetatae dr. iii ss.

Aceti Vini unc. iii. Solve super focum dein adde.

Aq. Distill. Frigid. lb. i ss.

Aq. Rosar. unc. iv.

This may be applied by means of pledgets of linen; or part of it may be made into a poultice, with crum of stale bread.

Saturnine poultices ought always to be applied cold; because we thus receive both the benefit of the cold, and of the lead. The directions which have already been given, with regard to the application of cold, are to be attended to here.

Lead has been supposed to act as an astringent; but, if astringents were useful, alum would be more effectual than any of the préparations of lead.

The vegetable acids have been considered as sedatives, and are generally employed in the cure of inflammation; but it would rather seem, as if they belonged to the class of agentes similes; for, in moderate quantities, they increase the appetite, &c. which no sedative, or agens dissimilis, ever does.\* They also excite a general action, which is different from that induced by sedatives, and which is useful in curing many of the actions induced by these agents. We likewise find, that they are not serviceable, as local applications,

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\* Like other agents of this kind, they may kill speedily, if drunk in too great quantities; and, after death, the vitality, from the previous great action, is found completely destroyed.

in the cure of inflammation, unless in so far as they become the vehicle for applying cold. The surface is not very susceptible of their action; and, therefore, those who are inclined to continue their use, may do so without injury, and even with benefit, if they be cold; but then the same benefit will be derived from cold water.

Alcohol is likewise considered by some as a sedative, and introduced as a remedy, in the enumeration of those which are applicable in inflammation;\* but, whatever its use may be in the *inflammatio debilis*, it must be allowed to be evidently hurtful in the *inflammatio valida*.

The last division of local application, contains those which tend, both simply to abate action in general, and also to excite, to a certain degree, a specific change of the action. Topical bleeding is the chief remedy belonging to this division. Bleeding with leeches, or the scarificator, is employed in two different circumstances: First, when we detract directly from the inflamed part; as, for instance, from the surface of a phlegmon: Secondly, when we detract only from the neighbourhood of the inflamed part; as, for instance, from the skin which covers an inflamed joint. When we employ topical bleeding, in the first case, we may suppose, that the aperture, and effusion from the extremities of the inflamed vessels, produces, to a certain degree, a change of action. Every action of the vessels is performed at their extremities, and the trunks and branches may be considered as canals subservient to the extremities, and which contract and dilate, in a degree proportioned to the general and local action. If, during health, we open a number of the extremities of these vessels, we induce the hemorrhagic action, which continues longer or shorter, according to circumstances, and which gradually terminates in a serous discharge, or secretion. If,

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\* Hunter on Inflammation, p. 350.

during inflammation, we open a number of the extremities of vessels, either in the inflamed part, or immediately contiguous to it, we induce a similar hemorrhagic action, which is different from the inflammatory one, and, therefore, tends to diminish that action in the part. We likewise, by inducing the serous secretion, tend to produce a termination to the inflammatory action.

Topical bleeding will also, in part, operate, by simply abating the action, in consequence of the mere loss of blood ; for, as the blood is withdrawn immediately, by different orifices, from the vessels of one part, that part, and those near it, may be supposed to suffer sooner, and to a greater degree, than the rest of the system. The branches which yield the blood, will even suffer considerably, for a time, although the loss of blood be very trifling, and produce no effect on the system. Thus, if one small artery be divided, we find, that, although the quantity of blood which flows from it be very inconsiderable, yet it is sufficient to produce evident changes in that vessel, making it contract, and become smaller, although the vessels in other parts be not at all affected. This depends upon the peculiar\* action of the individual artery being affected,† and the contracting state of the orifice, spreading along the branch and trunk by degrees,‡ by which

\* By peculiar action, I do not here mean what is commonly understood by the term specific, but the action which is proper to the artery, considered as an individual, in opposition to the action of the heart and arteries, considered in general as an entire circulating system ; for one part of this system may act less powerfully than another, and may be more dilated, &c.

† The distance to which this will extend, depends chiefly upon the quantity of blood which is lost, and the size of the vessel which is affected.

‡ This depends upon the operation of the sympathy of association. Sympathy was, in the preliminary dissertation, divided into that of association, and that of equilibrium ; and it was mentioned, that the same parts might be made to exhibit either of these, but that naturally the sympathy of association is chiefly, and most easily exhibited by those parts which are similar in structure, and contiguous to each other ; and, in them, the action spreads fastest. At the same time if the action continues long, or be very strong, it may be propagated to dissimilar parts,

less blood is made to circulate through it. Bleeding from a vein, however, has not the same effect ; because the quantity of blood in a part, is not so immediately dependent upon the state of the veins ; and because veins are not the seat of much action. When we divide a small vein, we find, that it, by degrees, contracts, and transmits less blood, or closes completely ; but the blood from the part does not circulate faster, nor is less blood sent to that part than formerly ; therefore, topical bleeding from veins near the affected part, can have no great superiority over general bleeding.

The division, then, of a number of small arteries, may cure inflammation in two ways ; first, by inducing a different action ; secondly, by possessing the general properties of bleeding, namely, a simple diminution of action. The first will operate chiefly, when we apply the leeches on part of the inflamed portion. The second will operate, when we detract only from the immediate vicinity ; and, in this case, the quantity of blood which is taken away, must be greater ; because the effect has to be extended some way, the vessels not being in the inflamed part. The quantity must likewise be greater, because the effect depends entirely upon this ; whereas, in the other case, it depended, in part, upon the peculiarity of the action, which was produced.

The number of leeches which it is necessary to apply, will depend upon the violence of the action, and the place on which they are set ; for, the greater the distance from the inflamed part, the more numerous ought they to be. It is therefore impossible to give any particular rule for the extent of topical bleeding. It may, however, be proper to observe, that we ought not to be satisfied with one applica-

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and produce either a very extensive, or an universal action, which is just a greater degree of the sympathy of association. In this case, it has, however, been called universal sympathy.

tion, more than with one venesection, for a general disease, but ought to repeat the local bleeding, whenever it may be necessary, although it may be twice or thrice in a day, founding our indications upon the same principle on which we use general bleeding. It is by a too sparing application of leeches, and their not being repeated sufficiently frequent, that we so often fail in removing inflammations, which, by a more active treatment, we might resolve. In general, the leeches ought to be applied as near the affected part as possible, or upon it. If, however, the seat of the inflammation be chiefly in the cutis, as in erysipelas, it will perhaps be more prudent not to apply them upon the spot; because the subsequent irritation is apt to increase the action afterwards, on account of the great delicacy of the part. There may even be some doubt as to the propriety of applying leeches to the vicinity of the inflammation; for the irritation of the bites may produce erysipelas in the part, or cause the original disease to spread.

The scarificator may be used where leeches cannot be obtained; but it is not so useful, when applied to the inflamed part, on account of the irritation which attends its application, and the cupping; but it is equally proper, where we detract not from the part itself, but from its vicinity.

Of the topical remedies, bleeding is the most powerful; and, next to that, cold solutions of lead. Where these cannot be employed, owing to the internal situation of the inflamed part, blisters must be used in their place.

Many other remedies used to be recommended, under the name of discutients, repellants, &c.; some of which have been formerly mentioned, when considering the ancient theories of inflammation; these, however, are now laid aside. But many practitioners still have an idea, that benefit will be derived from mechanically softening the parts by means

of oils, or what they call emollients ; and seem to consider, that poultices are chiefly useful for the same purpose ; at least they only direct, that they shall be removed before they turn "stiff or hard." But inflammation must be attributed to a different cause than increased attrition, and its cure must be effected by different agents from those which we employ for softening a piece of dead skin. Oils and liniments, in so far as they form a basis for other applications, or are used along with gentle friction, may be occasionally proper in the *inflammatio assuefacta* : but in the *inflammatio valida*, they must be considered as absolutely useless.

There are also some remedies, recommended with the intention of absorbing acrimonious excretions ; such as, flour or magnesia, in erysipelas. But these seem to act entirely by allowing the action to run its course, without interruption, affording a softer defence than could otherwise be obtained. From the quick progress of violent cuticular inflammation, the applications which are usually made in other inflammations have been forbid here, and are said to be pernicious ; but this rather appears to arise from the application not being properly timed, than from any peculiarity in the disease. It is not easy to give any good reason why cold saturnine solution of a proper weakness,\* and sufficiently early applied, should not be useful ; nor do we find, that they are in reality hurtful in simple erythema. Where this, however, attends wounds, or is not an original disease, these are improper ; because it is in general, in these cases, an attendant upon the *inflammatio debilis*, or a symptom of it, and requires either

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\* The solution must, upon the principles already laid down, be both weak, and only so cold as to reduce the sensation of the part to its natural condition, that is to say, so as to abate the morbid feeling of heat ; because, if we make it otherwise, we may injure the powers of recovery, and perhaps induce gangrene. The application ought not to be so cold as to excite the sensation of coldness, at least in any considerable degree.

to be let alone, or to have stimulating applications made to it, at the same time that we give bark internally.\*

These remarks upon the resolution of the inflammatio valida, may be concluded, by observing, that the diet ought to be low and sparing, in a degree proportioned to the violence of the action. Such motion as affects the local action, must at all times be prevented: but when a general action likewise exists, then general quietude must also be insisted on.

*Of the Remedies which are necessary for inducing  
Suppuration.*

Suppuration is a new action, the exciting cause of which is inflammation; but, that it may take place, it is requisite, that the inflammatory action be prevented from subsiding too soon, or too suddenly; in which case, either resolution, or inflammatio assuefacta, takes place: Whilst, on the other hand, we must prevent the action from rising too high, and proceeding too rapidly; in which case, mortification is caused.

In these cases, in which resolution cannot be obtained, suppuration will generally take place, without any interference on our part, provided we prevent the action from terminating in gangrene. This we observe in many internal inflammations. At the same time, we may sometimes accelerate this process, by a proper regulation of the original action.

The remedies proper for moderating and removing the inflammatory action, have been already mentioned; but these sometimes fail to produce resolution; in which case, either

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\* Bark is useful and necessary in every case of erysipelas, after the inflammatio valida has abated. Local applications, of a stimulating nature, are also useful at this period, as will afterwards be mentioned, when the inflammatio debilis comes to be considered.

suppuration, or mortification, takes place. When the symptoms of suppuration take place, (which have been already noticed,) all that is perhaps essentially necessary, is, to give up the resolving plan, and not interrupt the natural progress of the action. If, however, the inflammatory action continue longer stationary, and seem neither to be resolving, nor decidedly inducing the suppurative action, then such remedies as increase the action, and accelerate its progress, are essentially requisite. These remedies, however, are, in general, indiscriminately applied in both cases.

For the purpose of inducing, or accelerating the suppurative action, it was formerly the practice to apply liniments, cataplasms, and fomentations, composed of stimulating substances, such as garlic, turpentine, galbanum, &c. but of late these have been almost entirely abandoned. Heat and electricity have the property of increasing the performance of every action which is existing at the time of their application, and, therefore, are the remedies chiefly to be employed in the present instance.

Heat may be applied in two ways, with or without moisture. In the first, it increases action more suddenly, and perhaps more simply. In the second, its effects are more gradual, and are likewise complicated with those of moisture, which certainly is an agent capable of operating on the living system, and generally tends to excite a secretory action, or to give a secretory termination to those increased actions, which are induced by agents operating along with it. Dry heat is therefore evidently improper in the *inflammatio valida*, because it will tend to produce mortification; but, if moisture be conjoined, then the suppurative action is excited. When, however, the action has made an approach to the *inflammatio assuefacta*, then it may be useful to raise the action simply by dry heat, for a little, before we apply heat and moisture; because, if we apply moisture at first, the pro-

gress is more tedious, and the action is less certainly excited.\* Electricity is similar in its operation to heat and dryness, and may be usefully employed in similar cases; but we must, if we expect any benefit, repeat its operation frequently, and continue each application for a considerable time.†

There are two forms in which we employ heat and moisture, namely, fomentations and poultices. Fomentations‡ have this superiority over poultices, that the same degree of heat is always kept up during their application; whereas, when we use poultices, the heat subsides, as they are renewed only at considerable intervals; but fomentations require longer attendance, and more trouble; and, therefore, are only employed for a short time, and commonly betwixt the intervals at renewing the poultices.

Poultices are generally made of bread and milk boiled together, so as to form a thick kind of paste, to which is added, so much olive oil as will preserve it from hardening quickly.§ These ought to be applied, either of the same temperature with the inflamed part, or hotter, according to circumstances. When the inflammation seems to be naturally and quickly tending toward suppuration, it is, as has been already mentioned, by no means essential, that any ap-

\* From what has been said in the preliminary dissertation, we may understand how moisture should tend to induce a secretion. Agents frequently excite conditions somewhat similar to their general properties: Thus, putrid matter tends to induce the action of descent, and consequent putrefaction. We likewise experimentally find, that if moisture be applied during a general increased action, it induces perspiration, unless it be conjoined with cold, which lessens the action.

† The proper way to use electricity, in this case, is to draw scintillæ from the part, the patient being insulated.

‡ Fomentations are made, by applying a soft cloth, dipped in any warm fluid, (commonly water) to the part. Sometimes the cloth is wrung hard, in which case it is chiefly steam which is applied.

§ Poultices may also be made, by boiling pounded linseed-cake, or from potatoes, or mashed vegetable leaves (which are the cheapest for hospitals,) such as tussilago, &c.

plication be made externally, in order to induce the suppurative action;\* but still poultices are used, and, in many cases, accelerate the progress. In this case, the poultices should only be applied so hot as not to give any considerable sensation of heat, otherwise we increase the action too much, and too rapidly, and, if early employed, may even interrupt, or stop the incipient purulent action, renewing the inflammation, and perhaps making it terminate in partial gangrene. Poultices, then, should not be applied very hot at first, especially when the action seems to be such as to make us expect that it shall run its course without any assistance. But when the inflammatory action has been more tedious, and does not terminate in the suppurative one so soon, and so decidedly as we would wish, then poultices must be applied, with a different intention, being meant, not solely to prevent the action from sinking, as in the first case, but also to raise it, and make it brisker. The heat must therefore be greater, and such as to give a considerable sensation; and the poultices, instead of being changed only when they begin to grow hard,† which is perhaps all that is necessary in the first case, must be renewed very frequently, in order to keep up the increased degree of heat, or the agent which supports the action, and accelerates its progress. They ought, in this case, to be taken off and warmed or renewed almost every hour, at least when the action is

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\* The inflammatory action, when moderately strong, acts naturally as an exciting cause, inducing the purulent action, which is therefore said to be a termination of inflammation. It is therefore as unnecessary to interfere in the production of this secretion, when the action is of proper strength, &c. as it would be to attempt to increase, by local means, the vesication which is produced by a blister. Poultices are, in this condition, perhaps chiefly useful, by removing the causes which tend to abate the action at an improper time, such as those which produce resolution, as cold, &c.

† They keep up the heat of the part, and keep it moist until this happens, and prevent the action from flagging suddenly, which is all that is required of them, when the action is going on of itself in a proper degree.

tedious, that is to say, when they are most required. We are then not to lay down any certain degree of heat which is to be employed, nor fix any particular number of times at which the poultices must, in every instance, be changed, but regulate our practice entirely by the nature of each particular instance, taking the progress and degree of the action as our guide, in this respect, and interfering exactly in proportion to the necessity for interference. It may not, however, be improper to remark, that, *cæteris paribus*, the heat must be greater in proportion to the depth of the inflamed part below the skin; or, in other words, we must apply more heat, when we are obliged to act on a part not yet inflamed, than when we act directly on the inflamed part itself. When an abscess forms at a distance from the surface, the parts betwixt it and the surface gradually come, as was formerly mentioned, to assume the purulent action; and the sympathy of equilibrium, which naturally exists betwixt the surface and the parts below, gives way to the sympathy of association,\* the parts coming by degrees, to perform one uniform action together, which spreads from within to without. When we apply heat to the surface, at this place, we, by continuance, likewise induce the sympathy of associa-

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\* When two parts are affected at the same time, in consequence of an agent operating quickly on one of them, they commonly exhibit the sympathy of association, which takes place suddenly, but generally at first lasts only for a short time, if the parts be distant; but, if the original disease still continue, it may spread, inch by inch, until it arrives at the part which was formerly affected, and which is again affected more permanently, by the same kind of sympathy taking place, but in a different way. In the first case, we have the *sympathia consociationis interrupta*; in the second, the *sympathia consociationis serpens*. It is this last which is the cause of the extension of all action in a part, and which, when strongly excited, overcomes the natural tendency to the exhibition of the sympathy of equilibrium. It is, however, more difficult for local action to spread by degrees to parts which evince the sympathy of equilibrium than other parts; and these, in general, are longer of being affected. Thus, when inflammation begins in the skin, it can much more easily spread along the skin than dip down to the muscles.

tion, and the increased action spreads and operates on the disease; but there is this difference, that the action of the heat spreads from without to within, and thus accelerates the progress of the suppurative action.

When the suppurative action has existed a certain time, we find, that it gradually extends itself to the skin, purulent matter being formed, instead of organic particles; on which account, the cavity enlarges, and the covering becomes daily thinner. At last, the action reaches even to the cutis, which becomes white and flaccid, first at a point, and then to a greater extent.\* When this happens, the thin covering is either torn by the pressure of the contained fluid, acted on by the surrounding parts, or acting by its own weight; or, if this does not take place, the suppurative action still proceeds going through the cutis, the organization of which, like that of the parts below, is lost: The thin cuticle now rises up into a little blister, and then gives way. The matter runs gradually out, the sides collapse, and come nearer by degrees to each other, at the same time that the ulcerative action succeeds to the suppurative. The quantity of the discharge, therefore, daily lessens; the internal surface, or sides of the abscess, come in contact; and the granulations at the margin or circumference unite; those belonging to one side uniting with those of the other, and thus producing recovery by successive circles of reunion, which form rapidly, or more slowly, according to circumstances.

Such is the natural progress of an abscess; but it has been proposed, that it ought not to be allowed to follow this, but ought to be opened before it bursts spontaneously; and

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\* In proportion as the action extends outward, it also becomes more concentrated. An abscess is therefore somewhat conical, or at least hemispherical, the base being turned inward, and the apex outward. When the action reaches the surface, it is first at a single point; but, by degrees, it becomes extended, and the apex becomes broader.

this opening has generally been desired to be pretty large, chiefly perhaps on the principle of allowing a free evacuation of the matter. Where abscesses are seated over cavities into which they may burst,\* instead of opening externally, there can be no doubt of the necessity of making an early evacuation; and, in these cases, we ought to open them before the skin becomes white; or, in other words, before the action reaches the surface; because, if the abscess be seated equally betwixt the skin and the cavity below, we may suppose, that, if it be extending itself in all directions, or toward the cavity,† in the same proportion as outwardly, that the parts below will become almost irreparably diseased before it can reach the surface, and will give way afterwards,‡ even although an opening be made externally. Where, from the confinement of the matter, it seems to be spreading, or diffusing itself, by its gravity, through the cellular substance, or among the muscles, it will likewise be necessary to open the abscess early; but, in this case, the abscess is unhealthy; for, were it otherwise, the matter would be confined by the circle of diseased organic matter thrown out during the inflammatory action, and which is only removed

\* Such as the thorax, trachea, &c. Instances have happened of suffocation being thus produced.

† Although, in general, an abscess has little tendency to extend itself deep down, but rather moves toward the surface, although so far from it originally, that, had the action extended equally in all other directions, the size of the abscess must have been immense; yet, when it is situated over a cavity, it may proceed toward that as if to an external surface. Even, however, in this case, the general law, of all actions tending to the skin, obtains; for the progress outward is much quicker than that inward; but, if the action commenced near the surface of the cavity, as is commonly the case, the difference of the distance will compensate for the superior tendency to extend outward; and, therefore, the abscess may burst at the internal surface into the cavity.

‡ In abscesses seated on the thorax, I have known the intercostal muscles and pleura continue the suppurative action, after the external surface had opened, and thus an opening came to be formed into the thorax.

gradually. In this case, the suppurative action has extended itself laterally, and perhaps downward, more quickly than in health, and has not observed the same ratio, with regard to the extension toward the surface ; the action, therefore, reaches parts which were not formerly inflamed (by the *sympathia consociationis serpens*;) before the surface gives way ; and, therefore, the matter spreads or diffuses itself ; for, by the spreading of the action, the confining barrier is removed, and the matter mechanically extends itself. This is an unhealthy abscess, and the action is of the phagedenic nature. Opening the abscess will not always stop this morbid action ; but, by removing the matter, it will lessen the chance of diffusion. We must, however, continue the free evacuation, and place the member in a proper posture ; because, if the action continue, the matter which still is formed will lodge, and form sinuses.

In healthy abscesses, where we do not apprehend any detriment to the neighbouring parts, the question comes to be, whether opening them will accelerate the cure ? Perhaps much of the diversity of opinion on this subject, has arisen from not attending to the condition of the abscess which we have been managing, and thus we apply the prognosis and treatment of one kind of abscess to different ones. When an abscess has been formed slowly, and runs its course rather tediously, we may suppose, that the action shall continue for a considerable time without being converted into the ulcerative one ; and, therefore, the abscess shall remain long without healing. In this case, a free incision, or the irritation of a foreign body, may excite the ulcerative action, and thus accelerate the cure ; for these abscesses have come to approach toward the nature of common encysted tumors, and require the same treatment. But, where abscesses are running their progress with due celerity, and the action is proceeding through its proper course, there is not the same

cause for interference. If, in this case, we open them before the action has gained the surface, we derive no benefit ; because the action still proceeds, and the same events and circumstances take place as if we had allowed it to burst. If we make a large aperture, when the abscess is ready to burst, we, by the irritation, interfere with the process which was going on, and delay the cure. The admission of the air to the abscess, owing to the free exposure, is one cause of this delay ; for it changes the nature of the purulent action, and, if the ulcerative action takes place, frequently renders it unhealthy ; the consequence of which, if the abscess be large, or situated in vital parts, is hectic. We likewise, in large abscesses, by the sudden evacuation of the matter, and removal of the distension, sink the action of the parts, and make recovery more tedious.\* When the abscess, then, is healthy, and the action strong, it will be more proper to allow it to follow its natural course, and burst spontaneously, than open it, by a large incision, or by the introduction of a seton : If we do open it, the orifice should not at first be large, but should just comprehend the diseased or whitened surface.

Sometimes, after an abscess has burst, or been opened, it continues in a progressive state of amendment for some time, and then becomes stationary, continuing to discharge matter without healing. This either takes place from the whole surface, or from a particular part of it, forming a sinus, the treatment of which will afterwards be mentioned, being the same with those which succeed abscesses which are originally unhealthy.

After an abscess bursts, the proper application is a warm poultice,† which should be continued in general as long as

\* This likewise affects the system, and produces syncope, if the mechanical support be withdrawn suddenly from the parts.

† This poultice does not require to be so hot, nor changed so frequently, as before the full formation of matter.

there is any stool, or hard margin; that is to say, until the increased quantity of diseased organic particles, which were formed during the inflammation, be absorbed, and the vessels at that part have either assumed the suppurative or natural action. After this, the orifice ought to be covered with a slip of lint, and moderate pressure applied over the surface of the abscess,\* by which the sides are kept in constant contact, and reunion is accelerated. Good diet is also necessary, for we thus increase the powers of recovery, or keep up a proper action, and renew the vital principle, the quantity of which has been lessened during the inflammation, both by the continuance of a state of overaction, and by the remedies which are employed to diminish the action; for a state of real and permanent weakness is thus induced.

It sometimes happens, that suppuration takes place very slowly, and the action seems to be performed with little vigour. In this case, if the abscess be allowed to burst of itself, we both lose time, and are often, in the end, disappointed in a cure, the healing process not taking place. It is therefore useful, in these cases, to have recourse to other agents besides heat. If the pain be trifling, and the suppuration be what may be called chronic, or approaching to it, we will perhaps succeed, by applying gentle pressure on the abscess, by means of a thin roller, and laying a warm poultice over this. But, when this fails to increase the action, we ought to pass a seton, by which we evacuate the matter, and keep up the subsequent action to a degree sufficient for producing recovery. In doing this, however, it is necessary to attend to the state of the tumor; because, if, in every instance, we pass it from the highest to the lowest part, we shall sometimes make the part give way in a third place. If,

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\* If this produces pain, we may in general conclude that it has been used too soon.

for instance, the abscess be much thinner at the apex than elsewhere, or, if the action have made considerable progress toward the surface, then the stimulus of the action increases the performance of the natural process which was going on, and the action continues to extend itself until the part gives way. In these cases, then, we ought to pass the seton from the thin part to the lowest part; and this, in general, will, from the sympathy of association, be sufficient to excite the action of the whole internal surface.

When we resolve to use the seton, the following is the easiest method of introducing it: Make a puncture with a lancet either into the upper, or the thinnest, and most prominent part of the tumor, according to circumstances; and, into this puncture, introduce, using the lancet as a director, a probe, having a piece of tape passed through its eye. The lancet is then to be withdrawn, and the probe pushed down to the under part of the abscess, where its point will be felt under the skin. A small incision is here to be made upon the knob of the probe, which is next to be passed through, and the tape drawn after it. The matter is then to be slowly pressed out; the tape is to be folded; and the abscess bound up with a compress and roller, so as to make moderate pressure upon it. Next day, the dressings are to be removed, and a clean piece of the tape drawn through, after which, pressure is again to be applied.

The size of the tape, the time which the seton ought to be employed, and the degree of pressure to be used, must be regulated by backwardness of the action, and the imperfection of the healing process.

If, either from improper management, or the morbid condition of the action, the abscess, after it bursts spontaneously, or is opened by art, continue to suppurate, without undergoing the ulcerative action preparatory to healing, then we find,

that either the sides remain quite separate, producing a cavity, extended more or less, or one particular portion remains open, forming a sinus. Both of these cases require a treatment, which in its principle, is the same, namely, the indication of the ulcerative action.

In the first case,\* we shall frequently succeed by means of the seton, especially if we use pressure along with it ; for, by keeping the internal surface in close contact, we tend to check the purulent, or suppurative action, and produce organic particles.† We may also succeed, by using stimulating injections, of such a strength as to produce a moderate degree of smarting. Of this kind are, wine and water, solutions of white vitriol, corrosive sublimate, &c. These ought to be used frequently in the course of the day, and pressure employed during the intervals. Incision, or laying the part open, is, being the most severe, the last remedy which is to be had recourse to. Small chronic abscesses may be laid open during their whole diameter ; but larger ones require only to be cut up for a certain length.

The second case, has generally been considered as a species of ulcer, and has been named the sinus ulcer ; but, although the orifice may sometimes possess the diseased ulcerative action, yet the sinus itself still continues in the suppurative state, and, therefore, cannot heal. These sinuses depend, in different instances, upon very different causes, and, therefore, require a variation in the treatment. The most simple species of sinus may be called mechanical, and is pro-

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\* This is exactly similar to an encysted tumour which has been opened, and requires the same treatment. The internal surface becomes thick and somewhat hard, like that of a cyst. It differs from an encysted tumour only in its cause and origin.

† If pressure be employed early, to a considerable degree, the irritation of the means employed produces pain, and a morbid increase of action, unless we keep down the action by cold, as will be explained when considering the treatment of ulcers.

duced by matter flowing from a neighbouring cavity, and which cannot be freely discharged: Thus, for instance, if a deep abscess open at the highest part, or at a point above the level of its bottom, the matter constantly oozes out, and keeps the canal open. This is most apt to occur, when abscesses are formed deep among muscular parts; in which case, although the matter point at the centre, yet an accumulation must take place below, and the matter must continue to be discharged by the aperture, when it becomes so abundant as to be raised to the level of the opening; or, being once raised, it continues to flow out. The cure of this may at first be attempted mechanically, by tight bandages, which press out the matter, and keep the sides in contact; but, if the disease have been of long duration, then, whatever may have been its nature at first, we find, that the suppurative action extends along the mechanical sinus, which then becomes affected with a chronic action; in which case, it becomes similar to the second species of sinus. We must, in this species, make an opening at the most dependent part, and employ the means which will be now mentioned in considering the second species, or that produced in consequence of the suppurative action becoming chronic or habitual, independent of any mechanical cause. This may take place, although the aperture have been originally in a proper place, and the matter, instead of being retained, and keeping up the disease, shall have been regularly discharged. The case in which this is most likely to happen, is that in which the abscess has been very tedious in its progress, and the action has been from the first, slow. The distinction betwixt this species, and those which remain to be mentioned, is founded upon the absence of the symptoms which they possess, and by our examination with the probe, which points out the cause and extent, and informs us whether we be near a bone. The orifice is flabby, and has the appearance of the indolent ulcer. The

cure of these sinuses is to be attempted, by pressing out the matter by means of proper bandages, or by making a dependent opening, which is generally necessary, at the same time that we raise the action of the part to a proper degree, and render the suppurative action acute and vigorous ; in which case, it naturally terminates in the ulcerative, and thus the part has its structure restored. This is most easily effected, by passing a seton, and applying a proper degree of pressure, diminishing the size of the seton gradually, and in proportion to the vigour of the action and the approximation toward health. When, from the situation of the sinus, we cannot pass a seton (which rarely happens in this species of sinus,) injections of wine may be used frequently, and pressure applied during the intervals. When these means fail, which is seldom the case, the part should, if its structure permit, be laid open. If this sinus have remained long open, its surface, like that of the chronic abscess, becomes changed, and a coat is formed like the cyst of a tumour. When this is thick and hard, the sinus has been called a fistula, and it has been deemed necessary to dissect out the tube ; but it is in general sufficient to use the remedies which increase the vigour of the action, and make it run its natural progress ; such as the seton, or a free incision, if the parts be superficial, or no considerable vessel or nerve runs the risk of being wounded.

The third species of sinus is that in which the suppurative action is kept up by the operation of some adventitious cause ; such as a caries bone, diseased cartilage, or the lodgement of a foreign body ; as, for instance, a ball, a splinter of wood, bit of cloth, &c. This species is distinguished by our feeling the extraneous body, or diseased bone, with the probe, and by the fungous protuberance, or papilla, which shoots out from the orifice. In addition to the method of cur-

ing other sinuses, we must here endeavour to remove the adventitious cause, which is generally very difficult to be done. If the foreign body be deep, or if the diseased bone lie deep, and the sinus be narrow, we can do little in this way; sometimes, indeed, by enlarging the external part, we can come at the foreign body with a pair of small forceps, and may extract it, or may accelerate the exfoliation of the diseased bone; but we can have no certainty of success. If, however, the sinus be superficial, which sometimes happens in caries of the tibia, &c. it ought, in every instance, to be fully laid open, and the bone exposed, and treated in the way immediately to be mentioned. When this cannot be done, we may sometimes, by conveying the proper remedies through a tube down to the bone, procure exfoliation; or may by setons, injections, and pressure, procure a temporary cure; but, as long as the adventitious cause remains, we cannot expect a permanent recovery. It is observed, that sinuses, when they can be healed in these circumstances, break out again upon very trifling exertions, and very frequently are renewed, after a short interval, in spite of all our precautions; such as rest, warmth, &c.

A caries\* of the bone is at all times a disease which is difficult to manage, both on account of the mechanical obstacles which we have to overcome, and the slowness with which the affected parts perform their actions either of disease or recovery. The divisions of this disease have generally been taken from the appearance of the caries, and its extent. We have the dry caries, the worm-eaten caries, the

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\* When a bone becomes carious, the periosteum is completely detached, and, therefore, it is felt to be rough by the probe. Its colour becomes first of a dull white, or dirty yellow, which it either preserves, or changes for the intermediate hues betwixt these and black. It is generally more porous than formerly, and lighter; but these qualities vary, from very slight degrees, to the appearance of a light coralline.

spongy, or carious caries, &c. and we have the deep and superficial. But, as the cure of these is to be conducted on the same principles in all of them, and as they are most probably different degrees of the same complaint, it will be more useful to divide them into those which affect bones lying deeply, and those which affect the more superficial bones; because these different cases are attended with very different circumstances and symptoms. The first is preceded by an abscess, which forms generally with much pain, runs its course slowly, and does not burst for a considerable time. When it does open, its sides do not ulcerate, at least universally, but a sinus remains, the mouth, or exposed part of which only, assumes the ulcerative action. The second is more rarely preceded by any abscess, but is either coeval with the ulcer of soft parts, (both being produced by mechanical violence) or it succeeds the ulcer, and is caused by it. This ulcer belongs to the third genus, and will be afterwards described.

In treating of the cure of caries, the first thing is, to determine by what means the disease of the bone may be removed; and, secondly, what modification our treatment must undergo, in consequence of the caries belonging to the first or second species. From the very earliest periods, we find the application of stimulating and corrosive remedies recommended in this disease. The actual cautery, euphorbium, mineral acids, scalding oil, the essential oils, and warm balsams, have been universally employed, and frequently alternated with rasping and perforating the bone. This proceeded from observing, that, on the one hand, mild applications had no effect, and, on the other, that the natural slowness of exfoliation was overcome by the use of these more powerful remedies. A caries of a bone is correspondent to a mortification of a soft part; and, therefore, it is impossible

to restore the diseased part to health, or life. Our chief object, then, must be to prevent the disease from spreading, and to procure a speedy separation of the dead portion. The first is much less under our power than the second; for, it is most probable, that, in the majority of instances, at least of those of a simple nature, the disease, from the first, extends a certain length, affecting a portion of the bone, and that it afterwards makes very little progress. There is, however, a specific disease which affects the bone in common with the soft parts. The bone becomes rough, and suppurates; and the soft parts have a fiery appearance: This has been called the phagedenic caries. Cancer, scrophula, lues, and other specific actions, also spread after they are once induced. The second object is to be effected by such means as operate upon the vitality and action of the part, and those which act mechanically. Those which tend mechanically to remove the dead portion, are perforations down to the sound part, which we know has happened, by the bleeding which ensues; or, we may saw down this length with a trephine. We thus, by cutting off the communication of part of the diseased surface with the adjacent parts, kill it completely, sooner than could otherwise happen, and likewise stimulate the parts below to assume the ulcerative action, and throw it off. We may also sometimes be able to turn out these portions with a levator. Those which act more exclusively, by affecting the action of the part, are stimulating applications; such as heat, acids, &c. The actual cautery is so terrifying to the patient, that it is now laid aside; and it is likewise liable to this objection, that it may, by its operation on the neighbouring parts of the bone, produce disease in them. The potential cautery is more useful, and may frequently be employed with advantage, either in a solid form, as to callus, &c. or dissolved in water, and

applied with a pencil.\* M. Sue, in his notes to Ravaton's *Pratique*, &c. recommends l'eau mercurielle, or solution of mercury, in nitrous acid. By these means, the sound part below assumes the ulcerative action, its connexion with the diseased portion is then destroyed, and reparation takes place. The ulcer of the bone is red, and its surface covered with innumerable granulations, which rise up to the level of the surrounding parts, after which a cicatrice is formed. These granulations in the bone are absorbed, and others more perfect are deposited in their place, until at last they become completely osseous.†

The next point which merits our attention, is the situation of the bone, and the circumstances which attend the caries. When superficial, a fungous ulcer is produced, and the modification which this situation requires in the application of the general plan will come afterwards to be attended to; the modification in the treatment which is required in sinuses has been mentioned above. It may here only be remarked, that, where the sinuses are superficial, they may be laid open, which will induce the ulcerative action in their course, and allow us to apply the proper remedies to the bone; but where they run deep, we must either allow the disease to run its natural progress, and treat the constitution according

\* If we use the solution, we must, if the bone be very porous, or spongy, apply only a little at once, otherwise it may sink down, and injure a part which we do not wish to act on.

† There is a curious case of caries, which is frequently met with: The diseased part, instead of being cast off, is surrounded by a covering of new bone, (except at one portion, where a sinus and ulcer is formed in the soft parts) and may be felt rattling within it. In this case, there is necessarily a permanent enlargement of the part, from the additional bony matter; and this, together with the sinous openings, and the internal caries, being felt with the probe, form the character of the disease, which has been called necrosis, a term which formerly implied merely mortification. The cure of this complaint is to be accomplished by extracting the diseased part, when it becomes loose, if the opening in the case be sufficiently large; if not, it is to be enlarged with the trephine, &c. See the works of Ruysch, Desault, &c.; and, more lately, the publication of Mr. Russell.

to the effects produced, or, by means of a canula, convey a piece of caustic to the diseased part, in the same way as we treat obstinate strictures of the urethra, &c. When, with the probe, we feel the bone loose, we may assist its exit with the forceps, or by enlarging part of the sinus, according to circumstances.

When these sinuses communicate with joints, and depend upon diseased cartilages, tendons, or articulating surfaces of the bones, we can do very little in the way of curing them by injections or incisions; because we cannot thus remove the disease of the joint, but may increase it. Issues placed over the joint, with rest, cleanliness, and good diet, country air, &c. are the remedies chiefly to be employed in these cases; or, if hectic be induced, and these remedies fail, we must remove the diseased part, if this, on account of its situation, be practicable. When, however, these sinuses are superficial, and depend upon tendons not immediately connected with the articulation, it may be useful to lay them open, and treat the disease of the tendons with caustic, like a caries of a bone, or with escharotics, and stimulating applications.

The fourth species of sinuses, are those where a specific action exists,\* and prevents the healthy ulcerative action from forming. Of this kind is the scrophulous sinus, which is generally accompanied with a caries bone, or diseased cartilage, and, therefore, is a complicated sinus.† This is distinguished, where the bone is diseased, by a shining or polished red skin, like a cicatrix, surrounding the fungus papilla at the orifice of the sinus, or the scrophulous-looking sore which exists there. When no caries bone exists, we

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\* These sinuses cannot be considered in this dissertation.

† This may sometimes be produced by the formation of an abscess, without any evident cause; but at other times it is produced by wounds, &c. in scrophulous habits.

have no papilla, but only the diseased ulcer at the orifice. In both cases, there are generally the marks of a scrophulous habit. In the first case, we are to treat the sinus as if it were of the third species. In the second case, we are to treat it as if of the second, conjoining the proper remedies internally, as will be mentioned in considering the cure of scrophulous action. These sinuses, although healed, have a tendency to break out again, especially in the spring or summer.

The effects of the suppurative action upon the constitution, may be divided into those which are dependent upon the formation of the action, such as coldness, listlessness, &c. which are common to all new actions; and those which are peculiar to the action when fully formed. The first set requires no particular treatment, with an immediate reference to their removal; but their presence indicates the necessity of changing our method of cure, if we have not already done so. In conjunction with proper local applications, we must give light nourishing diet, with or without wine, according to the extent of the action and the weakness of the patient. Rest, and general warmth, are also necessary; but the heat ought not to be carried so far as to produce any considerable sensation, or sweating. Diaphoretics have been recommended;\* but there does not appear to be any necessity for their exhibition; because the coldness, and other symptoms which we intend to relieve, depend upon the state of the local action, and are only to be removed by fully forming this action. Heat will not cure this coldness, or shivering, when the action which causes it is extensive; but, on the contrary, will frequently increase it, by accelerating

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\* Mr. Hunter supposes that these are useful, "because they endeavour to keep up an universal harmony, by putting the skin in good humour, which quiets every sympathising part, and by counteracting the effects of irritability." P. 361.

the formative process. The immediate effects, then, or the primary symptoms of suppuration, require no particular treatment, with a view to their own removal, but are to be attended to as marks which point out the necessity of a change of treatment, with a view to keep up the action which induces them, and to prevent it from producing bad consequences afterwards to the constitution. Sometimes, indeed, in delicate people, suppuration at this period produces hysterical symptoms, such as languor, flatulence, or sometimes starting, tremors, and hysteric paroxysms, more or less distinct. The slighter affections of this kind may be frequently removed by a little warm wine and water; the more severe, by anodynes, conjoined with aromatic waters.

The second set of symptoms, or effects, are those which have been already described under the name of hectic, the production of which has formerly been explained. This action, when slight, has been called weakness, and has been considered as dependent upon the quantity of the discharge; but, for the reasons formerly mentioned, this cannot be admitted. The cure of this state is to be attempted, by lessening the local action, at the same time that we give soups, and other articles of nourishing diet, with a moderate proportion of wine, if this do not quicken the pulse, and produce heat of the skin. Anodynes in the evening, by procuring rest, will also be useful; but none of these remedies will produce their proper effect, unless the patient respire a pure air. Bark is considered as useful in these cases; but, unless good diet be conjoined, it is not of much benefit. If, however, we give the means of increasing the quantity of vital power, bark, by inducing an action more nearly resembling the natural one, will be serviceable; but, for this purpose, it must be exhibited in full doses. It is from giving this medicine too sparingly, and in cases where other causes, tending to counteract its effects, such as poor diet, bad air, &c.

are allowed to remain and operate, that bark has been brought into disrepute.

When the general action is very considerable, then the exquisite hectic is induced, and the situation of the patient becomes alarming. When the local action is simply the suppurative or ulcerative action, we may consider that the general disease is also simple, and are to attempt the cure by the remedies which have been just now mentioned. In conjunction with such local applications as tend to check the local action, we must have recourse to all those means which tend to strengthen or renew the natural action of the system in general; for which purpose, we must attend, in the first place, to all the particular functions, or individual parts; and, in the second, to the whole in the aggregate. Under the second head are included bark and wine, with moderate exercise,\* and proper diet; in the choice of which, we must be directed by the nourishment which is yielded, and by the capability of digesting the articles which we employ. In general, milk, soups, and jellies, answer best. Under the first head are included such remedies as tend to promote digestion, such as steel, bitters, mineral acids, &c. although in general the bark will supersede their use. The state of the bowels must also be attended to, avoiding costiveness on the one hand, and diarrhoea on the other. The secretion of the skin must also be regulated, stopping the colliquative sweating, if possible, by getting up for some time when it commences.† Lessening the quantity of bed-clothes, for a few minutes, will also sometimes interrupt it; but when it

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\* Exercise may be used either on foot, or on horseback, or in a carriage; and its degree must be regulated by the strength. There are few patients who cannot, bear moderate exercise (were it no more than walking half a minute in a garden.) and who will not be the better of this.

† Acids are supposed to check it; but they can only act by increasing the strength in a secondary way.

has continued long, it can only be checked by removing the diseased action.\* A full dose of the bark given before the accession of the sweat, may sometimes, by influencing the morbid action, prevent the discharge. The respiration must in particular be attended to; for, by breathing country and pure air, the action of respiration is more fully performed, and, consequently, the source of vitality is increased, and the effects of our other remedies are increased. The importance of a change of air can only be known by those who have observed how fast patients have recovered from operations when removed to the country, and clean lodgings, with well-aired beds, although before this they were daily sinking. Indeed no capital operation, which is likely to induce the suppurative action, ought to be performed, where cleanliness, and a free circulation of air, free from fœtor, cannot be procured.

It is not yet discovered that any remedy has a specific power of removing the hectic, or diseased formative action, more than the local purulent one;† and, therefore, we are obliged solely to trust to these already mentioned, which have a natural tendency to increase the healthy action, or induce one nearly similar to it, and especially to a proper local treatment, by which we remove the exciting cause.

When these remedies fail, and the disease seems to continue, or increase, in spite both of general and local remedies, then we must, if it be practicable, remove the diseased part by an operation; and, in doing so, we must remember, that delay beyond a certain period is dangerous; because the general action becomes so rooted, and the strength so reduced,

\* Sweating is perhaps to the general hectic action what the suppuration is to the local one; and, therefore, can only be stopped by influencing this action.

† A diet solely animal has been proposed in that peculiar species of hectic which accompanies diabetes; but whether it would be equally useful in other species remains to be determined.

that recovery cannot take place. Operating in these circumstances, therefore, can only hasten death. The wound will not unite nor heal, and the general action will continue unabated.

When the local action is specific, the general one is also different from the simple hectic; and, therefore the remedies which are useful in simple hectic will not be of equal advantage in these cases, unless a specific remedy be conjoined, as, for instance, mercury prudently exhibited in the venereal hectic, dependent upon a neglected local complaint. The most frequent instance of specific hectic is the scrophulous; for the cure of which we possess no remedy which acts with certainty. Whenever, therefore, the local complaint cannot be cured, and the hectic increases, we must, if possible, remove the diseased part;\* after which, the general action, notwithstanding its specific nature, most commonly declines; but the constitution still remains, as formerly, scrophulous, or even more so than before. That this is the case, would appear from the following fact: If a person slightly scrophulous, although originally sprung from a scrophulous stock, or in whom the constitutional disease seems to be disappearing, in consequence of intermarriages, &c. has, by means of a local injury done to a joint, &c. the scrophulous action excited, and consequent hectic, that person will, after cure, have the tendency to scrophula stronger in him than formerly; and the disease will even frequently be communicated to his children with its original violence.

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\* When this disease attacks the lungs, as it too frequently does, then, until a specific remedy for scrophula be discovered, no cure can be obtained. Simple ulceration, or suppuration of the lungs, however, and consequent hectic, may be cured, though not in every instance.

*Of the Treatment of the Ulcerative Action.*

SUPPURATION is a natural termination of inflammation; and the ulcerative action is invariably induced by the suppurative, unless this remain chronic. The ulcerative action is to be considered as in part a restoration of the natural one; for we find that it produces a restoration of the structure, granulations being formed by the vessels which formerly supplied the organic particles, whilst the interstitial vessels still yield a morbid fluid, called pus; but this they cease to do, whenever they again are placed in the natural situation; that is to say, whenever they become covered with the granulations, or are rendered interstitial. In proportion, then, as granulations are formed, a certain number of vessels are rendered interstitial, so that the discharge gradually diminishes, until at last it ceases; for, when we come to the formation of a cuticle, we have very few interstitial vessels left, the skin having naturally few. At this time, the one set of vessels having completed their action, and the part being restored, the other also resume their action, and a thin exhalent fluid is thrown out by the new cuticle, which keeps it soft and moist, and which is the natural insensible perspiration. The action of the two sets of vessels, then, is dependent on each other; and, whenever one is diseased, the other becomes also more or less so.

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GENUS I.

*Of the Healthy Ulcer.*

FROM these remarks, as well as from those which were formerly made, it will appear, that a healthy ulcer has a na-

tural tendency to heal, and that we ought only to be careful not to interrupt the natural progress, nor allow the action to flag.

In this genus of ulcers, the bottom of the sore seems to be paved with a number of small fleshy points, with minute interstices betwixt them, or surrounding their bases. These are of a red colour, with a slight shade of the purple, and are wet with a yellowish fluid, which is called pus; but which must of necessity differ from the fluid yielded by suppuration. This separates freely from the surface, when it is wiped or touched with a sponge, and then the granulations may be distinctly observed.\* The margins are smooth, thin, and a very little rounded, that is to say, are almost imperceptibly raised above the granulations, a circumstance which is essential to this ulcer, because, were they both on the same level, it would show, that the cicatrizing process did not go on properly; for, whenever the granulations rise to the level of the surface, they ought instantly to form skin. This cicatrix, which extends gradually from the circumference to the centre, is of a pale red colour; but the integuments immediately beyond it are white, and of the natural appearance. Sometimes, from a slight deviation or imperfection, one spot of the disk rises to the level sooner than the rest; but, in this case, it immediately skins, and the cicatrix extends from this in the same way as from the circumference, until they both meet. The sore is free from pain, the only sensation being a slight degree of smarting, or itchiness.

The treatment of this ulcer is very simple; for, in most cases, it is only essentially necessary that we prevent the operation of hurtful causes. We defend the part, by cover-

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\* Whenever the discharge does not separate completely from the surface, when it is wiped, but part of it remains, like a film, or jelly, betwixt the granulations, or on particular spots, we may be sure that the action is not healthy.

ing it with a soft pledget of lint, and keep it warm. When the cicatrization has commenced, it may be assisted by using an ointment containing any harmless powder, in such a proportion as to form a paste or scab upon the part,\* by which we afford an artificial covering, which remains in close contact with the granulations; and, by thus bringing them nearly into the same circumstances as when skin is formed, the cicatrizing action is accelerated. The same effect is sometimes produced, by allowing the pus to form a scab over superficial sores, by exposing them to the air, without any covering.

Dry lint is a very useful application; but, as it is apt to stick to the granulations, and tear them, when tender, it ought always to be well moistened before removal, which should be attempted slowly.

Mild ointments, such as the simple cerate, are frequently employed; but they must be free from all rancidity, otherwise they fret the skin, or injure the sore. In general, they are less useful than dry lint. When we do employ them, they ought to be applied only to the granulations and cicatrix; and not to the sound skin. More frequently we use these ointments spread on a pledget of linen, to keep the dry lint on the sore.

Poultices are also recommended in these cases; but they possess no peculiar advantage, and are apt to make the part feeble, and more likely to break out again.

Moderate pressure, by keeping up the action, is generally of service; but it is still more necessary when the action begins to flag, or becomes stationary. In this case, a compress ought to be placed over the sore, and the whole mem-

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\* Simple ointment, rubbed up with a fourth part of its weight of finely levigated calamine, or flowers of zinc, makes a useful application. Mr. Bell recommends, among other remedies, a saturnine ointment; but, if this produces any specific operation, it must be a hurtful one, *injuring* the action.

ber rolled firmly round with a cotton bandage ; or, what will be still more useful, the part should be encircled with strips, spread with adhesive plaster, in the way which will afterwards be mentioned. Pressure acts by taking away the condition of vacuity ; it forms an artificial covering and interstices for the superficial granulations, by which the natural process of forming granulations and skin is greatly assisted. The parts are, in this way, not only more quickly formed, but also in greater perfection ; and their powers of action are greater. The cure is therefore more permanent, and the part is not so apt to die, or ulcerate again, as when healed with simple dressings.

This practice, which is useful in ulcers which from the first are healthy, is still more necessary in curing those which were formerly diseased, but have now become healthy ; because, in them, the action is still more apt to flag.

The healing of large healthy ulcers which succeed to wounds, &c. will also be much hastened, if we artificially diminish the size of the cavity, and procure contact. Whenever one part can be brought in contact with another, it ought to be done, if the figure and functions of the part be not thereby injured, or if pain be not produced by doing so.

The older authors, from a mistaken theory, never allowed the action to proceed uninterrupted, or never co-operated with it in a rational manner. In every ulcer, it was necessary, first, to digest, or suppurate it, which was done with turpentine, or basilicon ; next it was to be deterged with turpentine, mixed with yolk of eggs, or by the red precipitate ; then it was to be incarnated by sarcotics, such as tincture of myrrh and aloes, balsam of Peru, frankincense, &c. ; lastly, the surface was to be dried into a callus, with dragon's blood, white-lead, chalk, &c. These plans have, however, been long laid aside ; but some practitioners still advise the use of styptics and spirit of wine to produce a cicatrix ; they for-

get, however, that skin is formed by a different process than corrugation.

The diet ought to be good, in all cases of ulcers; but spirituous liquors, and the irregularities of life, must be avoided:

In ulcers of the legs, if pressure be employed, rest is not absolutely requisite; but, if this be not used, no cure can be obtained, if the patient walk about. Even if the adhesive plaster be applied, we ought not to allow of so much motion as to produce fatigue, or any uneasiness in the sore.

The treatment, then, of this genus of ulcers, may be comprised in two aphorisms.

First. When the action is, from the first, healthy and vigorous, and is continuing so, all which is essentially necessary, is to defend the part, and prevent the operation of any cause which might injure the action, such as cold, too much heat, mechanical irritation, &c. This may be done, by applying a bit of dry lint, or a rag spread with simple ointment, and wrapping the limb round with a flannel roller. But, if the action begins to flag, as it often does in large ulcers, or if the process become stationary, we must then indispensably have recourse to gentle pressure.

Second. When the action has, at any one period, been diseased, or too low, but has been restored to a proper state, we must of necessity continue gentle pressure, and treat the sore as if the action were stationary, although it may not be so.

## GENUS II.

*Of the Indolent Ulcer.*

In this genus, the action is diminished, and, consequently, rendered imperfect and diseased.

Indolent ulcers, like those of the next genus, are divisible into two species: First, that in which both parts of the ulcerative action, namely, the granulating and purulent, are equally diseased, and equally imperfectly performed: Second, that in which one part is more affected than another.\*

The first species is distinguished by the following symptoms, which appear in greater or less degrees, according to the diminution and imperfection of the action.

The granulations are pale and imperfectly formed, partaking less of the firmness and organization of the healthy fleshy granulations in proportion to the affection of the action. They are obtuse, and scarcely at all elevated; and, therefore the surface loses its dotted, or red pointed appearance. The discharge is thin, and of a whitish colour, at the same time that we frequently observe isolated spots of lymph interwoven here and there with the imperfect granulations. Although these granulations are said not to be elevated, yet the surface often exhibits a species of fungus; but the individual granulations are not elevated, or pointed. This fungus never rises higher than the twentieth part of an inch above the level of the surrounding skin,† and often appears

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\* The circumstance of one part of an ulcer being more affected than another, will be more fully noticed in considering the next genus, in which it is of more practical consequence. Ulcers generally belong to this species, before they assume the characters of the second (for they frequently change from one species, or genus to another; in which case, the treatment must also be changed.)

† The cause why these granulations rise, even this trifling height, above the level of the skin, is the indolence of the action, which prevents a cuticle from being formed in due time.

only at particular parts of the surface. It is pale, and somewhat of a gelatinous appearance. The pain is trifling.

In more advanced cases, the whole disk is covered with a thin layer of lymphatic substance, which adheres firmly, and gives the idea of a thin pellicle being thrown over the granulations, which are seen imperfectly and irregularly through it. The discharge is generally thin, like serum, and considerable.\* The edges are hard and tumefied, sometimes of a light purple colour, at other times white.† The surrounding integuments are also hard and thickened, at least in old ulcers, and the veins are generally more or less varicose.

These appearances vary in degree from the soft pale surface, and thin whitish purulent discharge, with slightly thickened edges, to the state now described. The pain, when compared to the size of the ulcer, is not considerable.

This genus may occur, in a slight degree, in recent sores, from neglect, &c. ; but it is chiefly after ulcers have been of long standing, that they assume these appearances in the greatest degree. They may then be said to have become chronic or habitual ; and, in many instances, it is absolutely impossible to restore the action to its natural state, and produce recovery.‡

The second species is distinguished by the paleness and imperfection of the granulations, whilst the discharge is tolerably good ; but it never can be equal to that of the healthy

\* Indolence of the action does not imply that the quantity of a discharge should be lessened, but only that its nature should be changed. In this species, the discharge is much the same in quantity as in a healthy ulcer of the same size, but its perfection is greatly less.

† Sometimes the granulating action and the cicatrizing one seem to be confounded, the surface exhibiting a fibrous fleshy appearance. This I have seen most frequently in the calf of the leg ; but it may occur in other parts.

‡ These ulcers, after long continuance, frequently induce a disease in the bones or muscles seated below them, as will afterwards be mentioned.

ulcer ; because, when one part of the action is affected, the other is also more or less affected. This species does not require any more particular observation or mark, because it is to be treated exactly as the first, of which it is often just a slighter degree, or a forerunner ; for it is frequently the first change which takes place in a healthy ulcer. When it becomes diseased, it does not continue long ; for both parts soon come to suffer in the same proportion ; in which case, the ulcer belongs to the first species. For this reason, we never find old ulcers belonging to this species.

Chronic ulcers sometimes induce a disease of the bones, &c. below ; but, in this case, they generally are converted into a different genus. They also come naturally, in consequence of the great imperfection of their action, and the consequent want of power, to act beyond the due proportion betwixt action and power ; and, therefore, most ulcers of this genus come at last, if neglected, to belong to the next.

The most effectual remedy for these ulcers is pressure. This has been long employed, by means of tight rollers wound round the limb, or by the laced stocking. But, of late, a more effectual method has been proposed, namely, a bandage of adhesive plaster, which applies itself closely to the surface, and produces a state of artificial contact and covering. This has been recommended by Dr. Darwin in the form of a many-tailed bandage, and by Mr. Baynton in the form of strips, wrapped round the limb. The following is the method of applying them : A strip of adhesive plaster, about an inch broad, and so long as to encircle the limb and cross at each end, is to be warmed, and the middle of it applied to that part of the limb which is exactly opposite to the sore ; both ends are now to be brought forward, and one of them laid tightly over the under part of the sore (if it be so large as not to be covered with one strip,) whilst the other is brought firmly over this from the opposite side, and dou-

bled down upon it. The ends of the strip thus fold over each other at the ulcer. Another strip is then to be applied to the part of the sore contiguous to this which is not yet covered, and so on in succession, until the whole be covered. This is the best way of applying the strips, if the integuments be firm; but, if they be loose and yielding, it will be useful to push forward the loose skin from behind, with the strips, as we bring them forward; and, instead of laying down first one end, and then the other over it, make the two ends cross each other at the same time, and lay them down upon the skin, and not on each other, the under end covering the lower part of the sore, and the upper the part next it. The same strip, therefore, covers two portions of the surface, whereas, in the first way, it covered only one; but, in this case, the strip must be longer, as it must fairly cross the ulcer on each side, and be retained by sticking to the adjacent skin. When the ulcer is deep, the strip will press only on the margins; and, therefore, it will be useful to fill up the surface with a fold of soft lint. A thin cotton roller is now to be wound firmly round the limb, beginning at the extremity, and continuing the bandage to the next joint above the sore.

By this contrivance, we obtain a firm covering to the granulations, and bring a substance in contact with each individual. We then restore, as it were, the natural state of the parts, each granulation having a substance in contact with it; and a slight interstice is left between each, owing to their pointed structure. They become, therefore, similar, in this respect, to the organic particles of internal parts; on which account, healing goes on more quickly, and the organic particles, or granulations, are deposited in greater perfection, and with greater powers of action; for the unusual and morbid condition of exposure and want of contact is now removed. The same circumstances promote cicatriza-

tion, when the granulations have risen to a proper height. This is more evidently seen in the cure which is effected of the smaller ulcers, by dusting them with chalk, &c. or dressing them with an ointment made thick with some mild powder, by which a scab, or covering, is formed, which operates clearly independent of pressure. Pressure, applied with this view, ought to be moderate and permanent, and may be used with utility in almost every case of solution of continuity, however healthy the action may be. But, besides being of use in this way, pressure also produces a second set of effects, by mechanically exciting action in the part to which it is applied. Applied to the skin, it increases the cuticular action, and the skin is formed thicker. Applied to a weakened part, it increases the natural action of that part, and strengthens it: This is seen in the instance of debilitated muscles, &c. But, if the pressure be too great, then a morbid increase of action takes place, which even goes the length of inflammation, if the pressure be considerable; and this inflammation is either strong or weak, according as the pressure has operated; for, if many vessels be obstructed, as is commonly the case, then the power of the part is injured, and the action is weak; or, the same happens if pressure be applied in any manner to a weak part, or if the constitution be weak; as, for instance, from previous disease.

Pressure, applied to a part, increases in particular the functions of absorption and deposition. If moderate, these functions are moderately increased, and the structure of the part continues either the same, or it augments in size, as we observe, in the effects of walking, on the skin of the feet; but, if the pressure be greater, then these functions are morbidly increased, the particles are deposited imperfectly formed, and are as quickly taken up. The structure is therefore destroyed, and a vacuity formed. These effects are produced more easily upon diseased than healthy structures;

because their powers of acting, and sustaining action, are less. Friction is in this respect similar to pressure.

From these remarks, we may understand the mechanical utility of pressure in the cure of ulcers; for, when in a proper degree, it causes the absorption and destruction of the callous edges, or diseased substance, and likewise makes, if moderate, the diseased granulations be taken up, and more healthy ones be formed. We may likewise perceive, that, if the degree be too great, the action will become of an inflammatory nature, and injury will be done. We are therefore frequently under the necessity of counteracting this hurtful effect; for, the degree of pressure which is requisite for answering the first intention in old sores, or inducing action, in consequence of bringing the granulations or particles into the natural state of being in contact with some body, or covered by it,\* is often attended with such mechanical irritation, that the one effect would destroy the other, unless we kept the action within due bounds, by applying cold to the part. In healthy ulcers, the pressure necessary to produce its first set of effects, or to accelerate healing, by producing contact, is so trifling, that no counteracting effect takes place by the production of the second set of effects; and, therefore, no cold requires to be applied: But, in old ulcers, the pressure must be greater; and, therefore, cold water

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\* The degree of pressure necessary for producing this effect is proportioned to the susceptibility of the granulations, or organic particles, for receiving the impression of being in contact. When a part is healthy, the mere circumstance of juxtaposition is sufficient for this purpose; and, in a healthy ulcer, the weight of the body applied, such as powdered chalk, or plaster of Paris, or at least the gentle pressure of a stocking, or easy bandage, is all that is necessary. But, when the action is too low, and the granulations are consequently imperfect, both in their structure, power of acting, and capability of receiving impressions, the contact, in order to operate, must be nearer, and more complete; or, in other words, the pressure must be greater. In these cases, bandages not only act on the surface, but also on the parts below, and, therefore, increase the degree of contact of the newly-formed organic particles, and thus strengthen the part.

must be constantly applied to the bandage over the sore, by means of a sponge. We thus indeed lessen the effects of pressure on the absorbing system, and, therefore, the callus will be longer of being destroyed ; but we, on the other hand, prevent the action of the granulations from being rendered morbid.

The good effects of pressure, applied in a degree proportioned to the effect which we wish to produce, and to the state of the sore, are so universal, that it is unnecessary to give any examples of its success and utility. But, at the same time, it must be observed, that in old ulcers, and even in many of a more recent date, which have been much neglected, no application whatever will produce an uninterrupted cure ; for, after some time, it ceases to produce the same effect upon the action. The part seems, by continuance, to be less acted on by the agent ; the action is less affected, and slowly returns to its former state of imperfection. It is therefore necessary, either that we from time to time increase the power of our application, or vary our remedies, whenever the process becomes stationary. The latter is generally the most effectual way ; and the remedies which we alternate with the effects of pressure, are those of what have been called the stimulating kind ; but which of the individuals of this division ought to be employed, cannot always be determined, because one succeeds better in a particular instance than in another. It would, however, be of much importance, to ascertain which in general operated most effectually ; because, if we employ one which does no positive good, we sustain positive harm ; for the action is allowed to persevere in a retrograde process. I, therefore, paid particular attention to the operation of these applications, in the patients who were under my care in the Glasgow Infirmary.

Heat is found to increase almost every action ; and, therefore, in indolent ulcers, it is sometimes of use, especially for a

days after we begin the management of the sore, as it paves the way for the action of other agents, by beginning a change of the action. Poultices are the vehicle by which it is most frequently applied, and answers, in general, better than other forms. Fomentations are much used by many practitioners, who employ decoctions of different kinds of vegetables; but they have no superiority over poultices. Dry heat was used by M. Hevin, who held ignited charcoal near the sore; and it is sometimes of use to repeat this practice betwixt each dressing.

Electricity is of little service; because it cannot be constantly employed; and, therefore, its operation is only temporary.

It is worthy of observation, that although this kind of ulcer may be sometimes completely cured by the use of heat, that yet the action is not so perfect, and consequently the structure and power of the part is weaker, than when stimulating dressings are employed. Exercise, or any other cause, is therefore more apt to injure the part afterwards, and make it again break out into an ulcer.

The red precipitate, mixed with resinous ointment, in the proportion of a drachm of the former to an ounce of the latter, is a very useful dressing; but the ung. hyd. nit. mixed with four times its weight of hog's lard, forms an ointment which is still more generally useful.

Ten grains of the cuprum ammoniatum, rubbed up with an ounce of basilicon, or simple ointment, is sometimes useful, but cannot be depended on. The same may be said of an ointment composed of an ounce of ung. simplex, and ten drops of the oil of cloves, or of savin.

Cloths dipped in the aqua zinci vitriolati, or the solution of cuprum vitriolatum, diluted with water, so as only to smart moderately, are likewise of service, but not so frequently as weak solutions of the nitrates of silver, zinc, copper, bis-

muth, and many other metallic salts, such as muriate of mercury, &c.

Solution of common salt, or of nitre, of such a strength as to produce a moderate smarting, are of temporary advantage, but will not continue their effect long. Indeed, all solutions of saline substances, whether alkaline or metallic, are most useful when applied only for half an hour at a time, when the sore is dressing.

Mixtures of Thus, elemi, turpentine, canadine balsam, &c. with wax, or oil, have no advantage over the common ung. resinosum.\*

The bile, either by itself, or diluted, or mixed with yolk of eggs, does not seem to be of much service.

Lemon juice, or the mineral acids, particularly the nitrous, diluted so as to be of equal strength with the juice, are frequently of service.† Port wine is also an useful lotion.

Infusion of Cayenne pepper, in vinegar, added to water, in such a quantity as to smart, forms also a very useful application.

Of all these remedies, the ointments composed of the nitro-metallic salts, particularly the mercurial, are most generally useful: And the cure seems to be accelerated, by applying cloths dipped in weak solution of metallic salts, or weak acids, during the intervals of dressing. Whenever these applications fail, they must be dropped: And those which fail first, and soonest, seem to be the watery, or fluid applications; and, next to these, the simple resinous ointments.

\* An ointment composed of these resinous substances is much recommended in the *Acta Med. Berolin.* Tom. VII. p. 58.

† These acids coagulate the pus, and thus afford an artificial covering, or film, which remains in close contact with the granulations, and thus, by producing the natural circumstance of contact and covering, the effects of which have been already mentioned, as well as by creating a more vigorous action by their specific action, they frequently bring those sores into a healthy state.

These remedies generally produce their effect first at the margins. When this takes place we must diminish the strength of the application at that part, in proportion to the activity of the action, which is marked by the redness and pointedness of the granulation, and the cicatrizing state. The circumference, and the rest of the surface, must, in this case, be dressed with different strips of linen, spread with different ointments. Soft linen, spread with simple cerate, or dry lint, which is preferable, should be applied to the cicatrix, and cicatrizing granulations, whilst a stimulating substance is applying to the rest of the surface.

When the surface is obstinately diseased, or the action very torpid and imperfect, caustic has been applied; but, although I have often used it, and even applied cloths dipped in solutions of metallic salts, so strong as to form an universal eschar, or slough, yet no benefit whatever was derived; for we do not thus change the nature of the action, but only remove a layer of the surface, and leave that below in possession of the same mode of action with the former. Caustic is more useful, when applied to callus edges; but even these are more effectually removed, by remedies which act more permanently, and gradually, particularly by pressure. The ancients used to extirpate these with the knife, but few will consent to its use. It is indeed more speedy and effectual than the caustic; but, unless the action be afterwards properly supported, it will be of no permanent service.

The hard and thickened state of the surrounding integuments, in old ulcers, is best moderated by pressure; but this must be long continued.

Varicose veins were, by the ancients, considered as canals running into the sore, and furnishing the discharge; but, when we consider that these varices frequently occur without any ulceration, or discharge, the opinion must be abandoned. In such cases as occur along with ulceration, it will

be more natural to consider the affection of the vein as a disease dependent originally on the ulcer, and induced by it, in the same way as the structure and functions of other neighbouring parts are changed and impaired by the continuance of a tedious and diseased ulcerative action. This state of the vein being once induced in any part of it, and even in a slight degree, two consequences follow : First, from the power or property of the vein being impaired, the blood is not duly propelled, but circulates slowly, and cannot overcome readily the weight of the blood above, which presses more powerfully, in consequence of the valves being rendered imperfect by the distension of the vessel. The disease, therefore, gradually increases ; for, every day, the power of acting properly diminishes, at the same time that the mechanical necessity for acting, or the resistance of the column of blood increases. On account of the dilatation of the vessels, and the morbid or abortive effect to propel what they are unable to do, pain is produced, in the course of the varix, whenever the legs are kept in a dependent posture, or exercise is used. This pain is confounded with the uneasiness arising from the ulcer ; and, therefore, these ulcers are said to be painful, and to be attended with pain in the course of the veins.

The second consequence is, that, as the veins which are more immediately connected with the ulcerated part, are diseased, and do not perform their part in the circulation properly, the functions of the part must be still more injured, and the varix, which originally perhaps was produced by the ulcer, comes in its turn to act on the sore, and prevent its healing ; for the vein not acting properly, and conveying the blood fully, the action at the capillaries must be injured, and the artery and vein cannot act healthily. If this be the case, the power of forming granulations must be impeded,

and these never can be deposited in the necessary degree of perfection.

Two modes of cure have been proposed, the one palliative, and the other radical. The first is effected by means of rollers, or bandages, which prevent the vein from being distended, and, therefore, enable it the better to carry on its circulatory function. In this way, we prevent, to a certain degree, the hurtful operation of the vein upon the ulcer, and are often enabled to heal it up. But, as we do not thus restore the vein to its natural powers, unless in young people, who continue the support or pressure for years, we can obtain no permanent cure of the varix; and very frequently the parts again ulcerate; because, whenever the pressure or support is withdrawn, and the patient walks about, then the function of the part becomes affected, the organic particles are not deposited in the same state of perfection, and the action which is induced by exercise, causes the destruction of these granulations; or even the very circumstance of their being formed imperfectly is sufficient to produce their destruction, and the opening of the part; for all parts which have been formerly ulcerated are most ready to assume this action again, and the organic particles of that part are less perfect, and less able to bear action.

The second is obtained, by obliterating the diseased vein, or interrupting its communication with the trunk above, by which we make the blood take a different course, and be transmitted by healthy veins. If we now cure the sore, we find, that the same effects are produced as if we used permanent pressure; and, therefore, the functions of the part are more properly performed, and the organic particles possess greater power of acting, and sustaining action. The older surgeons proposed to effect the radical cure, by tying the vein at the two extremities of the diseased part, and cutting out the intercepted portion, or by laying it open, and

digesting it, as they said. This, however, was, as they confess themselves, very seldom submitted to in ulcers of the legs; and was rather inserted to complete their treatises, than from a belief that the operation ought to be insisted on. Of late, it has been proposed by Mr. Home, to tie only the upper extremity of the diseased portion,\* by which adhesion takes place at that spot, and the circulation is there stopped. The pressure of the blood above is thus taken off, and the blood from below must circulate, in a greater degree, through vessels which are better able to perform their functions; and, therefore, the actions of the capillary vessels, whether nutrition, absorption, or conversion of the blood from arterial into venous, must be more naturally performed. After the veins are tied, they gradually become smaller; for the pressure being permanently removed, the diseased veins can more fully propel their blood by lateral branches, at the same time that they receive less blood, more going by other vessels.

It is a curious circumstance, that although ulcers may have remained in an indolent state for many years, and have become almost habitual, that yet, the cause of the indolence being removed, they recover their powers rapidly, and with very little assistance. Thus, when a varix, which originally was produced by the ulcer, reacts on the sore, and prevents it from healing, we find, that if this cause be removed, the ulcer frequently heals quickly, owing to the sudden removal of a principal cause of indolence, although a similar ulcer, without varices, would not be cured by the same application in the same time; because then all the usual causes of indo-

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\* This operation is performed by making an incision through the skin which covers the vena saphena below the knee; a ligature is then passed under the vessel, by means of a blunt needle, and the vessel is tied. In two or three days the ligature may be removed, its circle being previously divided with a pair of scissors.

lence would still remain to be removed, or their effects counteracted; but, in this case, having suddenly removed one great cause, the action rises so much, that it can overcome the rest, although, without this alleviation, the healing process would not be commenced, nor continued. It may be useful to attend to this circumstance in every case of indolent ulcers, whether attended by varices or not; because, if we can remove any particular cause, we do much toward producing a cure. Thus, callus edges, and diseased, or thickened integuments, &c. although originally dependent on the ulcer, yet react on it, and prevent it from healing. If, then, by pressure, or otherwise, we remove these causes, we accelerate the cure.

As an instance of the good effects of tying varices, I shall transcribe the following case from Mr. Home's Observations: "A man, sixty years of age, had, for many years, gained his livelihood by going on messages, having been rendered unfit for any more laborious employment by a large ulcer on the left leg, just above the inner ankle. The complaint was of twelve years standing: It had been sometimes much better than at others, but had never been well during the whole of that period. In the year 1792, it became so bad as to confine him entirely. It was at this time I first saw him. Upon examining the limb, the veins were extremely large, and varicose; and the trunk of the vena saphena, at the knee, appeared almost the size of the little finger. The size of this vein led me to the idea of taking it up at that part, with a view of relieving the lower branches from the pressure of the blood, which I believed to be the cause why the parts remained weak, and the ulcer could not be healed. I explained my opinions upon this subject to the patient, and told him, that, if he thought it worth while to try it, I was very ready to do it for him. The man's desire to get well was such as to induce him to embrace the offer of any mode

of treatment which afforded the smallest chance of it. The vein was taken up in the way that I have mentioned: He complained of very little pain, no improper degree of inflammation was brought on by this operation, the ligature came away in nine days, and in fourteen the wound was healed.

“ The ulcer upon the leg was dressed with dry lint ; it put on a better appearance on the second day after the operation ; on the fourteenth it had diminished in size one half ; and in twenty-eight days was completely healed. He was also freed from a pain in the course of the veins of that leg, to which he had been subject for many years, whenever he used any exercise.

“ He returned to his business of carrying messages, and called upon me a year after, perfectly well ; his leg having continued sound.”

Issues have been proposed for the cure of this genus of ulcers ; but, upon the principles which have been already mentioned, it must be evident, that they can be of little or no service ; and, I am sure, that I never saw the smallest influence exerted by them over an ulcer. They are useful, however, after the ulcer is healed, by keeping up a secreting action, diminishing the risk of apoplexy, &c. ; but then they ought never to be introduced until the sore be nearly healed, or until we have reason to suppose that the sore will heal, and that they will be required.

The treatment of this genus of ulcers may be comprised in the following aphorisms :

First. When the action of an ulcer becomes too low and imperfect, pressure is the best remedy for restoring it to its proper state, and for accelerating the cure.

Second. Whenever this ceases to produce any farther effect, or the action relapses, and begins to go backward, we must lay aside the pressure for a time, and dress the sore

with some of the stimulating applications above mentioned, particularly the nitro-mercurial salts; and these, in their turn, must be laid aside, when they cease to produce a good effect, and the pressure be again had recourse to.

Third. When we use stimulating dressings, we must attend to the effects which they produce on different parts of the sore, and dress these differently, according to their condition. We must likewise proportion the strength of application to the state of the general action. Our remedies ought to smart most when the action is most torpid, and the smarting ought to continue longest; but, when the action has begun to be more perfect and vigorous, the same application will often be too strong.

Fourth. We must, in conjunction with this general plan, attend to particular morbid structures, which may be produced by the particular state of the ulcer, and which may react on it. The chronic thickness and hardness of the integuments, are best removed by pressure, and gentle frictions; but the restoration of the natural structure is very tedious. Callous edges are likewise best removed by pressure. When this fails, caustic must be repeatedly applied. Varicose veins may be palliated by firm bandages, but are, in general after they have continued long, only to be cured by an operation.

Fifth. When chronic ulcers can be healed, it is useful to form an issue, in order to keep up the accustomed secretory action; but these issues have little effect in advancing the cure.

## GENUS III.

*Of the overacting Ulcer.*

This genus comprehends two species: First, that in which the granulating, or purulent process is morbidly increased, or the two parts of the ulcerative action, the granulating and the purulent, do not correspond, or bear the same proportion to each other that they do in a healthy ulcer: Second, that in which a state of general acute overaction takes place, both parts of the ulcerative action being equally affected, and rendered diseased.

For the illustration of the first species, I may remark, that there are some actions performed by particular parts of the body which are apparently simple; but there are others which are complicated, and consist evidently of different parts, which, in the aggregate, form a peculiar action, but which action may be modified according to the degree in which these different parts exist. Thus, there are various parts which, when taken together, form the inflammatory action, heat, redness, swelling, &c.; but these may, in certain cases, exist in different proportions. The ulcerative action is a complicated one, and consists of the secretory and organizing action, or the purulent and granulating. These, in a healthy ulcer, bear a certain relation to each other, and are at all times so connected, that when one part is injured, the other is also affected; but the one part may be affected more than the other. In the indolent ulcer, or that in which the action is too low, both parts are most commonly (at least after some time) equally affected, and a state of universal diminution, and consequent imperfection, takes place; but, in the beginning of this state, that is to say, when the healthy ulcer is first becoming diseased, and when the unhealthy condition

has made little progress, it is not uncommon to observe an inequality in the action, or the granulations more affected than the discharge. In this genus of ulcers, however, the inequality is more striking, and frequently more permanent.

It is worthy of remark, that though the granulating action may be increased beyond the purulent one, that yet the purulent one never exists in a state of overaction without a correspondent affection of the granulating action; in which case, very different effects and symptoms are occasioned, and the second species of overacting ulcers is produced.

The first species has generally been described under the name of the fungous ulcer, or ulcer with hypersacosis. The granulations are soft and indistinct. They are imperfectly formed, and, therefore, do not possess the pointed appearance which they exhibit in health; nor have they equal powers of action, nor longevity. They are formed quickly, and rise to a greater or less height above the level of the surrounding skin. The margins are generally soft, tumid, and of a dull red colour. The discharge, if there be no carious bone, is tolerably thick, and of a white colour, and not in greater quantity than would be yielded by a healthy ulcer of the same size: The quantity is even sometimes less. The pain, unless when a bone is diseased, is seldom considerable. This species admits of two varieties. In the first, the granulating process is increased, in consequence of some affection of the action, which is independent of any mechanical cause. In this case, the fungus is generally pretty firm, but commonly pale, and the discharge tolerably good. In the second variety, the granulating process is increased in consequence of some mechanical irritation underneath, such as a piece of carious bone; and, in this case, the fungus is softer, and less firm; it is of a redder and more lively or fiery colour, and is sometimes covered, in particular parts, with spots of lymph; it bleeds upon the

slightest touch. The sore is generally painful, and the discharge thin, serous, and of a fœtid smell, while we can frequently perceive at least one small foramen on the surface which leads down to the bone, and through which it may be felt to be rough. Out of this is discharged a thin matter from the bone of a brownish colour, somewhat like soup, and more or less different from the discharge from the rest of the surface. These luxuriant granulations, however, must not be confounded with those which, at a later period, come from the bone itself, after it has begun to ulcerate. These are generally of a more florid red colour, though sometimes pale, and rise up either through chinks of the bare caries, or from such portions as are denuded by a previous exfoliation. They have in general, a more pointed appearance than those which arise from the soft parts, so that in many cases, the fungus resembles the surface of a strawberry, being rough. This variety may be induced quickly, the bone being injured, at the same time that the soft parts are affected; but, at other times, and perhaps more frequently, the bone becomes diseased, in consequence of the continuance of a simple ulcer immediately over it; as, for instance, on the tibia. In this case, the ulcer, which perhaps was formerly indolent, now changes its nature.

The second species exists in various degrees, and its symptoms admit of modification from the previous state of the ulcer. Sometimes an ulcer, although previously healthy, has its surface excited into a state of overaction, by exercise, or other causes. In this case, the sore becomes painful, and the granulations assume first a kind of light crimson colour, and then a brownish hue, from a species of mortification. They do not indeed become gangrenous, and slough, but they approach to a state nearly resembling death, and are absorbed. The edges are slightly erysipelatous, and the discharge watery. This may be called the first degree or stage of the

disease ; and the ulcer frequently recovers soon from this, and reassumes its healthy condition. But if it be neglected, or the injuring causes still continue, the state of overaction is increased, and becomes more perfect ;\* that is to say, the action which was injured in its different parts, and rendered unconnected by the incipient or new condition, becomes more compleatly and connectedly performed in its different parts, in an increased degree. The overacting state, which, in the first stage, took place, perhaps only for a few hours, or at least if it continued, did not rise to any great degree, or receive an augmentation in this stage, continues with violence, and generally with exacerbation. The granulations are absorbed almost as soon as they are deposited ; because, owing to the overaction of the part, they are very imperfectly organized, and possess very little life and power of supporting action.† They evidently appear to be in a state of overaction ; for they are fiery, and their colour, whether it be red or brownish, is bright or clear, and quite opposite to the dull hue which even the same colour may have in a different kind of sore. These bleed upon the slightest touch ; on which account, the discharge is generally bloody. The margins are red and ragged, as if they were bitten by a mouse ; and they are evidently in an ulcerating state. The surrounding skin is hot and erysipelatous, the discharge is thin and serous, and the pain great, generally somewhat of the burning kind. This sore, from the destruction of the granulations, and the propagation of a morbid degree of action, spreads as long as this condition continues ; but the progress, as long as the ulcer belongs to this genus, or as granulations are formed, is not very rapid.

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\* By this I mean more perfect in its state of overaction.

† In highly overacting ulcers, the granulations seem to possess a middle state, betwixt proper organic particles and the morbid substance, called pus.

It not unfrequently happens, that, after a sore which has been indolent has begun to heal, it, from fatigue, or some less evident cause, has a state of overaction induced, in which case, different appearances are exhibited, according to the previous state of the sore. If it has begun to form a natural cicatrix, this gives way, the surface becomes livid, the discharge thin, and the pain considerable. A thin slough of the granulations is then generally formed, and comes off in portions mixed with the discharge. If this state be not checked, it frequently comes to exhibit the acute symptoms of the overacting ulcer which was last described. More frequently, however, it occurs when the sore is still indolent, and not in the healing state, and when the edges still remain callous, and the granulations foul and unhealthy. If, at this time, a disproportionate, or overaction be induced, by exercise or otherwise, we find, that the surface becomes dark and sloughy, the granulations flat and indistinct, the discharge is increased, and the margins become tumid, and of a modena colour, whilst the surrounding integuments are of a dull red mottled colour, or erythematous; and the foot, if it take place in the leg, is frequently cold, and the pain darts down to the toe.

This state is not unfrequently produced in old ulcers, by a disease of the parts below,\* which has been induced by

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\* This affection of the ulcer, produced by a disease of the parts below, is induced with a frequency nearly proportioned to the aptitude of the part below for becoming diseased, by the continuance of an ulcer over them. Tendons and bones are particularly apt to be injured in this way; and, therefore, ulcers seated over tendinous parts, or bones thinly covered, are more apt to affect these, and to be reacted on themselves, than when seated over fleshy parts. On the same account, ulcers on the foot, or ankle joint, are worse to heal than those a little farther up the leg; and the difference is greater than can be explained wholly, by the circumstance of distance from the heart, and possessing less power of performing action properly. Recent ulcers likewise heal easily on the feet, by proper treatment. It is old ulcers alone which are difficult to manage, and the cause is obvious.

the long continuance of the ulcer, which renders the bone carious, if it lie immediately under it (in which case, the first species of overacting ulcers is produced;) but, at other times, by the sympathy of association, a diseased formative action (owing to the diseased formative action in the ulcer, or the imperfect granulations which are formed) is induced in the neighbouring parts, the muscles become pale, and have less of their fibrous texture, or the bone becomes rough, or pointed, like shagreen, and also becomes thickened, but without any appearance of caries. This diseased condition of the parts reacts on the ulcer, and induces overaction.

This state of overacting may also be induced in old ulcers, without any malformation of the parts below, but merely in consequence of continuance; for, after an ulcer has remained long indolent, it comes to act so imperfectly, that it naturally goes beyond its power. This may be said to be a spontaneous change, or conversion of one genus into another.

We have then two varieties of this species: First, the state of overaction induced in an ulcer which was previously healthy; and this admits of two stages, the incipient and confirmed: The first sometimes consists only of one short paroxysm; the second continues for a longer time, and generally depends upon the neglect of the first attack. Second, the state of overaction induced in an ulcer which has previously been indolent; and this admits of two subdivisions, which arise from the condition of the ulcer at the time of its overacting, namely, whether it have been healing and cicatrizing, or the edges have been callus, and the action imperfect and morbid.

The observations on the cure of this genus of ulcers must naturally be arranged under the different species and varieties of these ulcers.

In the first variety of the first species, our object is to remove the supernumerary, or fungous granulations, and to replace them with others, which are formed more slowly, and in greater perfection.

Pressure, applied in the manner already explained, is one of the most useful remedies in this variety, and ought always to be tried first. The luxuriant granulations are quickly absorbed, and the succeeding ones are rendered more compact and healthy, and the cicatrix begins to be formed. If, however, we apply pressure in this, or indeed in any sore, to such a degree as to produce its specific effect, we must counteract its irritation by cold. If we do not, this sore is frequently converted into the second variety of the second species of this genus.

Caustic, and escharotics, have been sometimes applied to these sores ; but they only remove a layer of granulations, without affecting the formation of the succeeding ones so much as some other remedies.

Stimulating applications are more useful ; for, as they act more slowly, they produce a greater influence on the action.

The cuprum vitriolatum, mixed with simple ointment, in the proportion of a drachm to the ounce, is frequently serviceable ; but the ung. hyd. nit. is still more useful. One drachm of this may be mixed with an ounce of hog's lard and a scruple of camphor. Red precipitate, mixed with resinous ointment, is also often of service.

The application of powdered rhubarb is recommended by Mr. Home, and is frequently of service.

Lotions of port wine, solutions of white vitriol, or rose water, containing as many drops of l'eau mercurielle\* as will make it moderately pungent, may be usefully applied before the dressing.

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\* L'eau mercurielle is a solution of mercury in nitrous acid.

Poultices seem to increase the diseased state ; and mild dressings do not counteract it, but allow it to go on.

The second variety is only to be cured by removing the caries bone ; but the same remedies which are used in the first variety may be employed here, as palliatives, or the means of preventing the ulcer from becoming worse. By a continuance of these applications, in cases of slight caries, a cure may, after some time, be obtained ; for the thin layer of diseased bone, either comes away in fragments through an opening in the ulcer,\* or it is sometimes absorbed. This last event, the absorption of the bone, is particularly induced by pressure, applied by means of the adhesive plaster ; and, therefore, where the disease is not extensive, it is always proper to have recourse to this ; but if, upon trial, we find it to fail, or to convert the sore into the second species of this genus, which it sometimes does, we must omit it.

As it is only in slight cases of caries that absorption of the bone is to be expected, we may consider it as necessary, in general, as a preparatory step toward healing, that the diseased portion of the bone be separated, and come away externally. It is therefore of advantage to endeavour to accelerate this ; because, whatever does so, hastens the cure. Our attempts, with this view, are made at two different stages, and with different intentions. First, when the bone has separated, or exfoliated from the part below, by making an incision through the ulcerated surface, we remove the dead part, and allow the sore to heal. This stage may be discovered, by pushing a probe through the opening, if

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\* In the description of this variety, it was mentioned, that there frequently was a small opening in the surface, which communicated with the bone ; but, even where this is not the case, the layer of dead bone, when it exfoliates, comes through the granulations ; for the granulations of the sound bone below raise it up, in consequence of which, pressure is made from within outward upon the ulcer, by which absorption is produced at that part, in a greater degree than deposition ; and, therefore, a vacuity is produced

there be one, or through the granulations, down to the layer of bone, which we find to be elastic when we press on it. But, even although the incision be made before this stage has taken place, no harm is done, because it is of use in the first stage. Second, when the carious bone has not yet exfoliated, but remains in contact with the rest of the bone, ulceration of the sound part not having yet taken place, it will be useful to make an incision down to the bone, and, as soon as the bleeding stops, or lessens, to apply caustic freely, in the whole course of the incision, so as to act upon the caries, or rough portion ; or we may use the trephine, or other remedies, which have been formerly mentioned. It sometimes happens, that the soft parts are, at particular portions, and often to a considerable extent, removed by absorption, and the bone, at these parts, is left bare. In this case, no incision is necessary, except occasionally through some bands of granulations which extend across the bare bone ; and, therefore, we can at once apply our remedies to the bone, or make perforation with the trephine.

The second species requires to be treated differently, according to its varieties.

As the incipient stage of the first variety frequently consists of only one short paroxysm, it would often be unnecessary to have recourse to any peculiar treatment ; but, as it is impossible, *a priori*, to say whether the state of evacuation is to continue, it is requisite, in every instance, to vary our treatment, and apply the proper remedies for the disease.

Poultices are frequently useful in this kind of ulcer, when the surface is dark coloured, and the integuments are not yet affected. They have sometimes an effect of checking the morbid state, if this be not already done ; but they more generally promote the absorption of the morbid granulations, after which the surface becomes healthy. If, however, the action be still greater, and more permanent, then

the ulcer is tending toward the confirmed, or perfect state of overaction, and poultices are not of equal service; they are even sometimes hurtful.

Gentle pressure, accompanied with the use of cold water, is of service in the same cases in which poultices are employed; that is to say, when the action has not become perfect, but has rather begun to subside, and the granulations remain dark coloured, and in a dying state. They are absorbed, and replaced with more perfect and healthy granulations.

When, however, the action still continues in the same state of overacting, or seems to be increasing, these remedies are rather hurtful; and we will derive more benefit from using applications of a gentle stimulating nature, which restore the action to a more perfect and natural state, in the same way as they cure the *inflammatio debilis*. For this purpose, one of the best applications is the following :

R. *Opii drachmas duas.*

*Camphoræ scrupulum.*

*Vini Albi uncias quatuor. Macera per triduum, dein cola.*

This may be applied by means of a bit of lint to the sore. It generally produces considerable smarting for a few minutes, after which the pain abates. The application is to be repeated every hour, or every two hours, until the sore begins to look healthy, and the pain abates. The adhesive plaster ought then to be substituted in its place.

Laudanum may also be employed with the same intention, but it is inferior to the other.

Lemon juice is also sometimes useful, and may be employed where the opiated wine fails, or is not at hand.

When the state of overaction becomes confirmed, and progressive, the sore spreads, becomes very painful, and assumes the appearances which have been already described. In this case, the application of carrot, or turnip poultices, is frequently useful. These vegetables are sometimes made into a poultice by boiling them, and, at other times, by rasping them down raw.

Camomile flowers, boiled in milk, and then expressed, yield a decoction, which, when made into a poultice with crumb of bread, frequently abates the pain. Sometimes the application of cloths, dipped in fine oil, give relief.

These sores are also frequently reduced to a more healthy state, by applying cloths dipped in the following mixture:

R. Ammon. Hepatizatæ\* guttas decem.  
Aq. Font. uncias octo.

This produces a moderate degree of smarting for a little time, during which the former painful sensation arising from the sore lessens, and does not return for some time. When the peculiar pain of the ulcer again manifests itself, the solution is again to be applied.

An ointment, consisting of two drachms of powdered opium, and one ounce of simple cerate, is also a very useful application.

Sprinkling the sore with red precipitate, or touching the surface with caustic, frequently stops the disease.

The kind of erythematous affection, which frequently affects the surrounding skin, is best removed by stimulating applications, which abate the pain or hot sensation, and make it less apt to ulcerate. The following is a very useful ap-

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\* The ammonia hepatizata is prepared by passing a stream of hepatic gas through the aqua ammoniæ.

plication for this purpose. The affected part is to be lightly dusted with it occasionally :

R. Hyd. Precip. Rub. unc. i.

Pulv. Opii semiunc.

Cretæ Ppt. unc. ii. Tere simul ut fiat pulvis subtiliss.

When, by any of these applications, the state of overaction is overcome, pressure is the best remedy for preserving our ground, and producing a cure ; for, remedies which may be useful in the diseased state, will be hurtful when this state is removed.

In this sore, anodynes are to be freely employed internally ; for, given sparingly, they do no good.\*

All the applications ought to be made gently, and lightly ; because any mechanical irritation increases the disease.

The second variety of this species is a very troublesome ulcer, and admits, as has been already observed, of two divisions : First, it not unfrequently happens, that, after an indolent ulcer has been in a healing state for some time, a state of overaction is induced, by fatigue, or other causes, particularly by the natural inability of the newly formed, and not completely perfect granulations, to sustain the action which is necessarily induced in them by their connexion with other parts (upon the principle of the communication of action.) In this case, the sore becomes foul, dark coloured, and painful, whilst the cicatrix ulcerates, and the new granulations die, so that, in a short time, the ulcer regains

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\* No external application whatever will produce the same good effect, if used by itself, as when such a general action is induced as shall co-operate with the local remedies. In slight cases, thirty drops of laudanum may be given twice a day ; but, when the overaction is more violent, the dose must be more frequently repeated.

its original size, and even spreads slowly to a greater extent. Second, an old ulcer may, without having been previously in a healing state, become converted into the overacting ulcer; because the surface has its power so weakened, that common agents, which naturally excite action in the part, excite a disproportioned and morbid action in the ulcer; but this action is of the low kind, and bears somewhat the same relation to the first species, (or overacting ulcerative action, in ulcers previously healthy,) that the *inflammatio debilis* does to the *inflammatio valida*. In this case, the surface is bloody, and the half-formed granulations are of a livid colour; the callus edges are of a dusky red, or Modena colour; the integuments are generally mottled; the inferior part of the limb is cold and painful.

In the cure of the first division, we must enjoin rest, as in the second variety of the first species, and apply cloths, dipped in a mixture of two parts of laudanum and one of camphorated spirit of wine, which produces at first considerable smarting; but the sensation is different from the former pain; and, although uneasy, is yet more tolerable than the peculiar pain of the ulcer. This application ought to be renewed two or three times in the course of the day, until the surface becomes of a better appearance, and the pain abates.

The application of the powder of bark to these sores is sometimes, but very seldom, of service.\*

A poultice, formed of decoction of camomile flowers, opium, and charcoal,† is frequently of use, and should be em-

\* This was probably recommended on account of the sphacelated appearance which these sores sometimes have.

† Let two ounces of camomile flowers be boiled in three pounds of water down to two. When this is cold, it ought to be strained, and half a drachm of opium diffused in a pound of the decoction. Of this, a sufficient quantity is to be added to powdered charcoal, in order to form a poultice.

ployed when the laudanum and camphorated spirit fail. This should be applied cold.

In the second division, the fermenting poultice\* is often of service; but it must, like all other applications, be continued no longer than the state which it was intended to remove remains. If we continue it too long, we do hurt; for, if it be kept on when it produces continued pain, it induces a state of overaction, similar to that which it was intended to destroy. Whenever the surface becomes redder, and the pain less, it may be useful to employ some other application, such as laudanum, &c.

The same observations apply to the use of the gastric juice. Cloths dipped in this sometimes make the overacting surface slough off, and leave the parts below more healthy. The same may be said of the expressed juice of sorrel.

Lime water sometimes operates in the same way.

Red precipitate, mixed with its weight of powdered opium, and half its weight of camphor, may be usefully sprinkled over the surface.

A pound of the recent leaves of hemlock, boiled for half an hour in two pounds of milk, and then expressed, forms an application which sometimes abates the pain, and renders the action more healthy. The juice is to be made into a poultice with crumb of bread.

Decoction of the walnut tree leaves, applied by means of pledgets of linen, or made into a poultice with bran, is occasionally of service.

When, by any of these applications, the morbid state of the ulcer is removed, it is to be dressed according to the genus into which it is then converted.

\* The fermenting poultice is made by adding a spoonful of yeast to an oatmeal poultice, and placing it before the fire until it begins to emit air, or rise up in a bubbling way. It is then fit for applying to the sore

After these remarks, the treatment of this genus of ulcers may be comprised in the following observations :

First. In the first variety of the first species, or the simple fungous ulcer, the cure is to be attempted by pressure, and gentle stimulants, which render the action more natural, and the granulations, in consequence, more perfect and compact.

Second. In the second variety of this species, we are to employ the same remedies, as palliatives, or as means which may promote the exfoliation of the bone. But, if the disease in the bone be more extensive and tedious, we must cut down through the ulcer, and apply caustic, or mechanical cures, such as perforation, to the caries.

Third. In the incipient stage of the first variety of the second species, we must avoid motion, and all other such causes as tend simply to increase action. When the disease has consisted of one short paroxysm, which has terminated, we must promote the absorption of the diseased granulations, and the process of replacing them with others which are more perfect, which is effected by such remedies as render the action which forms them more natural. This is best done by gentle pressure, and sometimes by poultices. If, however, the paroxysm continue longer, but in a moderate degree, we must use such applications as tend more directly to change the action, and diminish the morbid condition ; such as camphorated and opiated preparations, and sometimes the vegetable acids.

Fourth. When this state becomes confirmed and progressive, the action being violent, we must use remedies nearly similar to those which are employed in the last case, and which are useful in the cure of the *inflammatio debilis*, at the same time that we enjoin rest, and keep the part as easy as possible. In some instances, the action cannot be overcome directly by any application, but is rather increased by

them. In this case, we must lay these aside, and use mild and light applications; such as fine oil, fresh cream, &c.; at the same time that we avoid the general causes tending to increase action; such as motion, heat, spirits, &c.

Fifth. When this state occurs in chronic ulcers, we must use such remedies as tend to remove the dead or dying granulations which frequently cover the surface, and such as at the same time produce a more natural action, and restore to the succeeding granulations greater powers and perfection, and a more healthy mode of acting. Stimulating applications frequently have this effect; such as the fermenting poultice, precipitate ointment, &c.; at other times, narcotic applications; such as cicuta, &c. are useful.

Sixth. In these ulcers, the redness and pain of the skin which surrounds the ulcer, is to be treated as the inflammation assuefacta, by being dusted with the powder which has been already mentioned, or by similar remedies.

Seventh. In all of these ulcers, where the action is violent, much benefit will be derived from inducing the general narcotic action to a considerable extent. Anodynes are therefore to be freely administered, at the same time that we employ the proper local remedies.

Eighth. Whenever the ulcer becomes more healthy, and the action less morbid, the strength of the application is to be diminished; and, when the state of overaction is destroyed, it must be treated as the indolent ulcer, because the granulations are still feeble. Pressure is most useful in this case.

## GENUS IV.

*Of the Inflammatory Ulcer.*

It sometimes happens, that the ulcerative action becomes converted into the inflammatory; the discharge diminishes, and sometimes ceases; the surface is red; and the edges and surrounding skin are elevated and inflamed. This, which has been called the phlogosis ulceris,\* strictly speaking, does not belong to the division of ulcers, because the ulcerative action is destroyed; but, as it is preceded, and very quickly followed by this action, and as the solution of continuity, and other external appearances continue, this affection may be allowed to rank as a genus among ulcers, in conformity to common language.

When the pain and inflammation are considerable, leeches are frequently applied with utility in the vicinity of the sore; but it is more generally useful to apply warm poultices, which restore the secretory state, and the ulcerative action.

## GENUS V.

*Of the Suppurating Ulcer.*

THIS genus, like the last, accurately speaking, does not belong to the class of ulcers; but, as it is so intimately con-

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\* Siccitas rubido et phlogosis ulceris facile cognoscentur; dolore, pruritu, calore stipantur; ea impediunt carnis excrescentiam, adeoque indicant remedia emollientia," &c. Sauvage Nosol. Meth. tom. ii. p. 613.

nected with it, both in its causes, and treatment, and appearances, it is of some practical utility to admit the arrangement.

When an abscess is opened before the ulcerative action is induced, we have an open suppurating sore ; but this is not the sore which is meant to be described here.

The suppurating ulcer is, when simple, and independent of any specific action, most frequently only a high degree of the overacting ulcer ; but, as its symptoms are somewhat different, and as it nearly resembles some specific sores, differing from these only in the absence of the peculiar action, resulting from the application of a poison, it may be proper to consider this as a separate genus.

When the ulcerative action is very imperfectly carried on, which often arises from overaction, we find, that the organic particles are thrown out, not in the form of granulations, but in a more inorganic state, and lie upon the surface, mixed with the discharge from the other set of vessels. This has the appearance of very thick tough pus, and the sore which yields it may properly be considered to be in a suppurating state. This ulcer is distinguished by the pain which attends it, by a redness which surrounds the margin, and a hardened base, whilst the cavity of the ulcer is filled up with a thick straw-coloured substance, somewhat like lymph, which adheres firmly to the surface. This is improperly called a slough.

This appearance and condition may be excited in a simple ulcer, without any apparent application of contagion ; but it is still more frequently the consequence of some morbid matter acting on the part, and producing specific ulceration, which will be afterwards considered. I may only here observe, that it has, in some of these cases, been considered as a species of gangrene, as, for instance, in the *cynanche maligna* ; but, whatever may take place in the advanced stages

of this disease, there is at first no gangrene, but a suppurating ulcer, which throws out imperfect granulations, or rather a morbid purulent discharge, (for the one runs naturally into the other,) which forms what is called a slough.

The treatment of this ulcer consists first in procuring a separation of the tenacious covering, by such remedies as shall at the same time that they do this, make the action more healthy.

A pretty strong solution of the *argentum nitratum*, or *l'eau mercurielle*, diluted with equal parts of distilled water, applied by means of a brush, frequently produce the desired effect.

The acetous infusion of Cayenne pepper applied in the same way, is likewise useful.

Poultices made of decoction of camomile flowers, and equal parts of charcoal and barley meal, are sometimes of service in removing the matter, and rendering the action more truly ulcerative.

Opiates ought to be freely administered.

When this state of the sore is removed, the ulcer must be treated according to the condition of the ulcerative action. Most frequently it belongs first to the overacting genus, and must be treated accordingly, and then to the genus of indolent ulcers, in which case, pressure is to be employed as a termination to the cure.

When an overacting ulcer has, without the assistance of local applications, ceased to overact, it not unfrequently suppurates; that is to say, no granulations are formed, but the two sets of vessels throw out an inorganic matter, and the surface of the sore has a lymphatic appearance.

The best dressing for this state is dry lint with a pledget spread with cerate laid over it.

*Of the Effects of the Ulcerative action on the  
Constitution.*

The condition and qualities of an ulcer, do not, in every instance, depend upon causes which are entirely local, but frequently are connected with some general state, or mode of action, of the system. General weakness must, for example, influence the performance of any action in a particular part ; and, therefore, an ulcer in those who are infirm, and exhausted, cannot readily perform the necessary healthy action, or proceed quickly toward a cure ; nor is it easy, in these circumstances, by any local applications, to communicate the necessary action, and the correspondent power, which shall enable the part to heal. In the same way, there are some people so irritable, that an ulcer shall very readily assume the over-acting state which can only be removed by such remedies as act on the general system. Besides those which may be considered as simple conditions, there are many other actions, which are peculiar and unnatural, which influence the ulcer, or in which ulcers often appear as symptoms. These ulcers are specific, and must be afterwards considered.

As the state of the system has a considerable influence on the condition of an ulcer, so also has the state of the ulcerative action an effect on the constitution. A healthy ulcer, unless very extensive, has little effect on the system ; but, unhealthy ulcers, or those which are very large, although the action may be sufficiently perfect, produce a greater or less degree of the general diseased formative action, or what is called hectic.

From the principles which have already been laid down, it may easily be understood how an unhealthy ulcer should induce hectic. When considering the doctrine of suppuration, the effects of this on the constitution, or the production of

a general diseased formative action were attended to. It was also mentioned, when considering ulceration, that the ulcerative action had a tendency to produce similar effects ; and this it does, with a certainty proportioned, *cæteris paribus*, to the unhealthy condition of the action, or its approximation to the suppurative action ; for the less perfect that the ulcerative action is, the more nearly does it resemble the suppurative one.

Healthy ulcers, if very extensive, produce likewise considerable effects on the constitution. This is chiefly perhaps owing to the purulent action, which makes a part of the ulcerative one ; for this morbid local secretory action induces a general change, in the same way as other acute changes, of either the formative action itself, or any other intimately connected with it, such as the interstitial. But, besides this cause, the granulating action, although healthy, co-operates with the diseased interstitial action, or the purulent part of the ulcerative action ; because, although the granulations, or organic particles, be healthy, yet they are formed in an unnatural situation, and with greater rapidity, and in greater numbers, in a given time, than naturally they ought to be ; and, therefore, the action of the part requires greater power for its continuance than is possessed. There is consequently, then, weakness produced, which, by association affects the system, and co-operates with the diseased formative action, increasing the general disease. The consequence of this state, likewise, is, that the ulcer comes, after some time, to be rendered unhealthy, owing to the deficiency of power to support the necessary action ; in which case, the granulating action comes to be also diseased, and co-operates still more with the former morbid condition of the interstitial vessels or the purulent action, which, although a part of a healthy ulcerative action, is yet itself a morbid secretion, and an unnatural action.

The effects of the ulcerative action on the constitution, are to be alleviated by good diet, free air, and the other remedies which have been pointed out when formerly considering hectic, to which I now refer. I shall only observe, that some of these remedies are employed occasionally with little judgment, and when they are not indicated. It is, for instance, a common practice with some, to prescribe the bark for the cure of every ulcer, whether the constitution be affected or not. But from many trials, I am confident that it is of very little service, unless when a general disease, whether it be called weakness or hectic, exists.

When the proper remedies for the cure of hectic, conjoined with necessary local applications, fail, the diseased part must be removed ; but, before doing so, it is, in every instance, proper to form a pea issue, in order still to keep up a secretory action, the good effects of which have been already noticed.

The restlessness, and febrile symptoms, which are sometimes produced by painful sores, are best relieved by anodynes.

### *Of the Cure of the Inflammatio Debilis, and the Treatment of Mortification*

The causes and nature of mortification having been already explained, I shall now consider the means of prevention, and the method of cure. The remedies necessary for procuring the resolution, or suppuration of the inflammatio valida, having been formerly enumerated, it will be unnecessary here to make any repetition, or to say more that that we are to prevent mortification by endeavouring to induce one or other of the other terminations, and that the remedies which do so are to be employed with a promptitude and assiduity proportioned to the greatness of the action compared to the

powers of the part; and, therefore, that in the intestines, &c. we must pursue our course speedily, if we expect to prevent gangrene.

Mortification, however, is still more apt to succeed the *inflammatio debilis*, or inflammation of weakened parts; and, therefore, the treatment of this will now more naturally come to be considered, as forming a part of the prophylaxis of mortification, than in any other place.

The most frequent instance which we have of the *inflammatio debilis*, is the inflammation of parts which have been previously benumbed with cold; but it may also be produced by the action of any of the common exciting causes of inflammation, in weak and reduced habits, or by bruises in sound parts, &c.

When a part has been exposed to much cold, it may inflame, from two causes: First, the communication of action; secondly, the application of subsequent stimulants, more especially heat. Both of these tend to excite an action in the part, which is greater than its power would naturally perform, and, therefore, it becomes diseased, or inflammation is produced, and the little energy which did remain is soon destroyed. The operation of the first cause is prevented by lessening the action of the surrounding parts, by the application of moderate cold, whilst we avoid motion, and whatever may tend to act directly on the part, and co-operate with this cause. The operation of the second cause is prevented by keeping away every agent which will tend to excite action, or at least those which tend to do so suddenly. In the generality of cases, it is perhaps most proper at first to do nothing; because, whatever we apply, tends to excite a greater action than can be sustained; we ought, therefore, to delay any remedy until the part has begun to recover itself, and the action and corresponding power has begun naturally to increase; we may then interfere, by applying such

remedies as increase the action, which are perhaps now more useful, by preserving the ground which is gained, than by increasing still farther the action. Of this kind is heat, which must, upon this principle, be applied with great caution, and must, in its degree, be nicely adjusted to the existing state of action. When a part, then, is benumbed with cold, we ought at first to apply a degree of heat, very little above that which the parts were formerly exposed to, which, in one sense, may be said to be doing nothing; for this step is intended merely to prevent farther injury. When this is continued for a short time, we may suppose that the part has begun to act a little more in a natural way, which is attended, as was formerly explained,\* with a correspondent increase of injury. We then increase the heat, but very slowly, and taking a long time to bring the part near its natural temperature, being regulated by the progress which the part itself is making; for the application of heat may be considered in two points of view, in this case; first, as the removal of the injuring cause; and, secondly, as a stimulus to action. If, then, the part do not recover itself, in proportion to the removal of the hurtful cause, but remain stationary, it is evident that a farther removal is at present useless, and the stimulus which is consequently given is highly dangerous. By these means, then, we proceed slowly toward recovery, and keep up the ground which we have gained.

If, however, the action of the part have been sunk very low, then recovery is impossible, there being little or no energy, and so little action, that it cannot increase itself toward the natural state. In this case, our endeavours must fail, and will even kill the part sooner than if we had let it alone; for the least increase of action destroys the life of

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\* See the preliminary dissertation.

the part, which may, in this case, be compared to a dying taper, which gives one brighter flash before it becomes forever extinguished.

If, on the other hand, the action have not originally been sunk so low as to make the process toward death continue progressively, but the remedies have been applied too quickly, or, from any cause, have failed to produce this effect, then the action becomes inflammatory. The pain becomes of a burning kind, there is a feeling of pulsation, and the part becomes redder, or livid, whereas, before, it was bluish; from the stagnation of the blood, there was no feeling of pulsation, or arterial motion, and the sensation was that of a painful cold and weight. The *inflammatio debilis* is now induced, and the danger is great, but still there is a possibility of recovery, which is exactly in proportion to the degree of previous diminution of action, and to the rapidity with which the subsequent inflammatory action was induced, and the degree to which it is raised; or, in other words, the danger is proportioned to the disparity betwixt the action and the power.

The remedies for this disease are such as tend to induce an action similar to the natural one, by which we remove the diseased one; for we know of none which excite the natural action directly, otherwise they would be of universal utility, and would, in the present instance, be preferred to every other. The remedies which we employ with this intention, are bark, opium, &c. internally, and vinous, or spiritous applications externally. These, however, would be pernicious, were there no inflammation present, because they would, by exciting action, tend to induce this; but, when the inflammatory action is once induced, then, as they excite one more nearly resembling the natural one, they are useful; for, on the one hand, they destroy the morbid one, and, on the other, increase the power of recovery; but, for this pur-

pose, internal medicines, and good diet, must be given, as a source whence the energy is to be renewed, by the renewal of the natural action. Heat is of the most pernicious tendency in this complaint; because it simply increases the exciting action, and, therefore, makes the inflammatory action still more violent. The applications, therefore, ought to be cold, as long as the morbid action continues; but, when it is abating, and recovery is going forward, they may be made a little warmer, as they will thus accelerate the healing process which is taking place; but this requires much prudence.

Spirit of wine is one of the best applications in this disease, and is one very generally employed. Camphor is frequently added to it, and appears to increase its efficacy. Pledgets dipped in camphorated spirit of wine, and applied to the part, will, if frequently renewed, in many cases, remove the inflammation, and prevent gangrene; but, in every instance, it at least relieves the pain, which uniformly returns, if, when the inflammation is violent, we omit the application, or use a weaker spirit, such as the proof spirit.

Essential oils, particularly that of turpentine, which is easiest procured, are also useful, but are inferior to the alcohol.

Laudanum, in slight cases, is useful as a topical application; but, if the inflammation be more severe, it must be mixed with rectified spirit. A very useful application may be prepared by adding two ounces of laudanum to a pound of the *spt. vin. camph.* of the pharmacopœia.

Internally, the bark must be exhibited in full doses, with such a quantity of wine as the feebleness of the pulse points out; but we must be prudent in this respect, because, if we give too much, we may increase the local disease. As long as it does not increase the pain, or quicken the pulse, it is to be considered as useful.

Opiates are extremely necessary in the *inflammatio debilis*, and, in general, require to be given freely.

Soups, and other articles of nourishing diet, are absolutely requisite, and ought to be given in small quantities at a time, but frequently repeated.

By these means we may frequently resolve the inflammation completely ; but, at other times, when we have gained a certain ground, the inflammation terminates in the suppurative action ; or, in other words, when the parts have gained more strength, and the action has come more nearly to resemble the *inflammatio valida*, which has continued for some time, a similar termination takes place. This event cannot, perhaps, in these cases, be prevented, and, although it may occasionally protract the cure, yet it diminishes the danger, making mortification less to be dreaded. The best treatment, in these cases, perhaps, is to continue our usual applications, avoiding warm poultices until the action be fully formed ; then moderate heat may accelerate the progress of the abscess toward the surface. The same internal medicines must be exhibited, the anodynes, however, being gradually diminished as the pain (which marks the necessity for their use) abates.

It too frequently, however, happens, that either our remedies fail, or the proper ones are not assiduously and judiciously employed, in which case mortification takes place. This requires the same treatment, in whatever way it is induced, only its progress is, from certain causes, more rapid\* in one case than in another, and, therefore requires the more free use of the appropriate remedies ; but the general principle is, in every case, the same, and, therefore, I shall here consider the disease indiscriminately, whether it succeeds the inflam-

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\* It is more rapid in the *inflammatio debilis* than in the *inflammatio valida*, and in very delicate parts than in parts which are less so.

*inflammatio valida*, or *debilis* ; because, in both instances, the case is exactly the same, only, in the first, the weakness which induces mortification, is produced by the inflammation alone, whereas, in the second, it existed to a great degree before the inflammation was excited.

Mortification is to be prevented from succeeding the *inflammatio valida*, by timely bleeding, and the use of the *agentes dissimiles*, by which we procure resolution, or at least make the induction of the purulent action more easy. In the *inflammatio debilis*, it is to be prevented by remedies of an opposite nature.

When, however, these remedies fail, and mortification does take place, our great object must be to prevent it from extending far, and from injuring the system. These intentions are answered by the same remedies which cure the *inflammatio debilis* ; because the local treatment of mortification is merely that of the *inflammatio debilis* ; for it is only the parts which are still alive, or inflamed, which can be acted on by our remedies.

The remedies are either general or topical, and may be considered under these divisions ; but both must be used at the same time.

Many of the older writers, proceeding upon the humoural theories, began their treatment of gangrene by bleeding and purging, after which they prescribed *theriaca*, and other stimulating applications. Some modern authors still adhere, in part, to this practice, and consider the loss of blood to be advantageous in cases of incipient gangrene. Mr. Bell, who is one of the latest writers on this subject, informs us, that, when the “ general symptoms of inflammation, particularly a quick, full, or hard pulse, still continue violent, and especially when the patient is young and plethoric, it then becomes absolutely necessary, even although mortification may have commenced, to empty the vessels a little by one

general blood-letting," which, "in such cases, may in reality be considered as an antiseptic; and it does often indeed, in this particular situation of mortification, prove more powerfully so, than all the different articles in general enumerated as such." If, however, we consider the nature of mortification, and the circumstances under which it is most likely to occur, we must look upon this practice as dangerous, and must be permitted to doubt whether the full hard pulse is to be met with after the commencement of inflammation, or whether the symptoms of the *inflammatio valida*, (in which alone bleeding is admissible) still continue violent, after one portion of the inflamed part is evidently gangrenous. Is it reasonable to suppose that one portion of the inflamed part shall be already dead, or dying, and that yet the rest shall not have begun to suffer? or that the action shall not have become converted into the *inflammatio debilis*, (if it were not originally this?) This surely is not the time for bleeding, purging, and debilitating remedies; but the part must be considered as possessing the low inflammatory action, and the patient as requiring suitable remedies. It may indeed be said by some, in favour of bleeding, that the bark, in some instances, does not check the progress of the disease; but it surely does not thence follow, that it does positive injury, and that remedies of an opposite nature are useful.

The peruvian bark is, in many cases, one of the most useful internal remedies. It was originally introduced into medicine, about one hundred and fifty years ago, as a cure for intermittent fever; and its utility in gangrene is said to have been discovered by its curing this disease in a person who had it combined with ague, and who was taking the bark on account of the latter complaint. For many years after it was known in Europe, great prejudices prevailed among physicians against its use, partly on account of its having been

improperly administered, but still more because it was so unfortunate as to cure diseases without necessarily either sweating or purging the patient, a fact which could be only ill explained, or rather scarcely allowed to be possible, by the prevailing theories of physic. Accordingly, although the cases in which it had been successful were by no means a secret, and although several had the courage to employ it, in spite of all speculative arguments, yet neither Dr. Boerhaave, nor his commentator, Van Swieten, thought it expedient either to recommend or prescribe it. Renewing the motion of the stagnating blood by venesection, and the exhibition of trifling remedies, which could scarcely be called cordial, although sometimes dignified with that epithet, together with the external application of ardent spirits, or oil of turpentine, constituted the current practice in gangrene. These prejudices against the bark, which originated in ignorance, and were supported by attention to a foolish theory, continued long; but the want of a better remedy began at last to make them gradually give way, and the success of empirics who used the bark soon completed their downfall.

The bark induces an action nearly similar to the natural one, which is greatly injured, and, therefore, it gives a check to the progress of the disease; but, if its operation be not assisted by nourishment, &c. its good effects soon subside, because the materials whence new energy can be drawn are withheld, and, therefore, the system cannot profit so much by the establishment of the new action, and by the restoration of the power of converting the vital principle of foreign matter into nervous energy. The bark, then, is of service in two points of view: First, it changes directly the action of the system, it induces, in a considerable degree, an action somewhat similar to the natural action, and, therefore, counteracts the general action of descent which was taking place. Secondly, by inducing this action, it, to a certain degree.

produces the same effects for a time which would have been produced by the natural action itself, or increases the power of renewing vitality ; for, in the preliminary dissertation, it was mentioned, that the production of energy was exactly proportioned to the perfection and healthiness of the existing action. The good effects of bark, then, cannot be obtained without nourishment and free air.

It uniformly happens, however, that, in many instances, where the action of the bark would be most beneficial, it is impossible to induce it, owing to several causes, but particularly to its effect on the stomach ; for, in many instances, it produces sickness, or nausea, in which case it can do no good, and ought to be abandoned. Momentary sickness, after taking a dose of bark, is indeed a very general effect, and does not materially injure its operation ; but, whenever it is either frequently vomited, or produces a sickness of considerable duration, it must either be given in smaller quantities, or in a different form, or at longer intervals ; or if all of these fail, it must be laid aside completely, because it not only cannot produce its specific effect, but will even injure the remaining powers by its effect upon the stomach.

The best form in which bark can be prescribed is that of powder, which is more effectual than any tincture, or the extracts. This ought to be exhibited in as great quantity as the stomach will bear, which cannot be reduced to any certain scale. In general, an adult ought, if possible, to take half a drachm, or two scruples, every forty minutes, in the most palatable vehicle ; for much depends upon the taste, owing to the sympathy betwixt the mouth and the stomach ; and, for this reason, the same vehicle ought seldom to be used more than twice in immediate succession ; because, by changing the vehicle, we not only change the taste, which has a tendency to prevent loathing, but also modify the immediate action on the stomach, changing, to a certain degree,

the former impression, which was perhaps beginning to produce sickness. Lemon juice and water, the different kinds of wines, punch, pimento, cinnamon, and peppermint waters, milk, rose water, beer, &c. afford us a variation which may be usefully employed.

The tincture and watery infusion of the bark, either separately or mixed together, are frequently employed, when the powder is vomited; but, as they must be given in very considerable quantities, in order to produce any good effect, they are very apt to produce sickness, and are likewise so inferior in power to the powder, that they are very little to be trusted.

The extract with resin, is a better form than the tincture, or infusion; and, where the powder is rejected, may be made into pills.

When the stomach rejects every form and preparation, it has been proposed to give the bark in clysters, and this ought certainly to be done rather than lose the effects of the remedy; but, given in this way, its effects are more uncertain. From two drachms to half an ounce of the powder of bark, may be diffused in three ounces of soup, or mucilage, with fifteen or twenty drops of laudanum, and given as an enema. This must be repeated at least every hour and a half, or two hours, until the stomach can retain the medicine.

The wine is very usefully conjoined with the bark, and is even of considerable use by itself, when the bark is rejected. Its operation is more speedy than that of the bark, but it is perhaps more fugacious. The quantity which is necessary to be given depends upon the effect of the local disease upon the system, and on the inability to bear other remedies. A table spoonful may be given in general every quarter of an hour, unless it increase the pain, and frequency of pulse, and produce restlessness, and heat of the skin. In

these circumstances, we may be certain that we have increased the quantity beyond the necessity.\*

Opium is likewise an useful remedy in this disease, and ought never to be omitted; because it not only diminishes the irritability, and, consequently, the pain, but likewise, like the wine and the bark, counteracts, by the induction of its peculiar action, the progress of the inflammatio debilis, and, consequently, tends to check the mortification. This medicine is most usefully exhibited in full doses, which not only procure ease, but also frequently make the stomach more readily bear other remedies. One grain of the extract, or twenty-five drops of the tincture, may be given at once, and the dose repeated whenever the action of the former subsides. After some time, each dose must be increased one half, and presently doubled, in order to produce the same effect as it did at first.

These remedies may give a temporary check to the disease; but, unless nourishment be conjoined, in every possible form, they will not of themselves be able to effect a cure, if the disease be tedious. Soups, jellies, milk, sago, &c. must be assiduously given in small quantities, and even thrown up as clysters, if the stomach cannot bear them.

Vegetable acids, fixed air, wort, &c. have been recommended in this disease, probably upon the supposition of the existence of a putrescent matter, or from their utility in scurvy. Wort, however, and fixed air, do not appear to be of very great benefit in this disease, at least they are by no means to be put in competition with other remedies of more approved efficacy, or allowed to interfere with their exhibition. The acid of lemons seems to be more generally useful

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\* The necessity for this, and other remedies, is in general proportioned to the continuance of the disease, and the progress which it has made. In this, as in every other disease, we must be attentive to the effects of our remedies, and consider these in forming our opinion.

than the carbonic acid; and, perhaps, the nitrous acid would be equally useful with the citric acid. These acids do not operate by counteracting putrefaction, but by counteracting the action of descent, inducing a more healthy action, and tending to excite ulceration, which is the mean employed for separating the dead part, and producing restoration. For this purpose, however, the acids must be given freely, otherwise no good is done.

The local treatment is to be conducted on the same principle as in the cure of the *inflammatio debilis*. Pledgets, dipped in the oil of turpentine, tincture of myrrh, or rather in camphorated spirit of wine, which is one of the best applications which can be used, ought to be made use of.

These remedies can do little service when applied to the dead portion; but, as the whole part does not die at once, there are always some portions which are still in the inflamed state, and on which they act. They likewise prevent the progress of the disease, by operating on the skin which is contiguous to the gangrene. Every mortification, in general, attacks the skin first; or, in other words, the *inflammatio debilis* spreads faster along the skin than along the deeper parts; but, when once the skin is inflamed, and mortifies, the disease extends to a greater or less depth below the surface. Whatever, then, operates on the surface, and prevents the progress of the inflammation, or cures the part which is already inflamed, will tend to check the extension of the disease, especially if the proper internal remedies be made use of with a view to prevent the extension of the action of descent.

Formerly, in order to allow these remedies to come in contact with the living parts, it was customary to make incisions through the dead portion, and not unfrequently through part of the living substance. But as these cannot prevent the extension of the disease over a greater surface, and, as the irritation which is given, and the exposure of parts which

have not yet assumed the ulcerative action, tend to increase the inflammatio debilis, the practice must be considered as improper.\* It is now indeed almost universally laid aside, owing, in a great measure, to the observations of the ingenious Mr. Pott.

Antiseptics, such as decoction of camomile flowers, &c. have been recommended as external applications ; but, whatever effects they may have on the matter which is already dead, it is evident that they can be of no service in preserving the living parts from suffering death. All that can be expected from them is to check the putrefaction of the dead substance, which they have very little power to do ; and, therefore, they can never come into competition with more valuable remedies, such as the camphorated spirit of wine, &c.

When, by the use of the remedies already mentioned, the progress of the gangrene is stopped, the ulcerative action is induced in the part immediately adjoining to the dead portion, and a red line of separation appears. By means of this ulcerative action, which takes place in every point where the mortification stops, the dead part is separated from the living, and comes away as soon as the bonds of dead muscular fibres, tendons, &c. which unite them, are destroyed by putrefaction. When this separation takes place, or when it is advanced so far as to permit us to accelerate it by dividing the loose tendons, &c. the exposed part must be dressed as an ulcer, or wrapped up in a poultice of the same temperature with the human body.

If, however, the disease have penetrated deep, and destroyed the limb so much as to render it impossible to cure it, or useless, if it were possible, then amputation must be perform-

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\* The hot and almost boiling oils, which were poured into these incisions, contributed not a little to increase the disease.

ed; but this, whatever desire the patient may express, must not be practised until the mortification be fully stopped, and the ulcerative action induced; because if performed sooner, the mortification seizes the stump, and the patient is quickly killed. The system is likewise in such a state as to be unable to sustain the action which is necessarily produced by the operation. It is even improper to cut too near the diseased portion; because the parts here, although the mortification be stopped, are so weakened, that they are less apt to unite. The vessels often break out soon after they are tied, and a new mortification is by no means an unlikely occurrence. Even when the amputation is performed pretty far up the limb, the corners of the stump frequently mortify, or become livid; but a few doses of bark and wine stop the progress of the disease.

Although it is a general rule that amputation is necessary whenever the member is so destroyed as to become useless, and although this must not be performed until the ulcerative action be induced, yet it must not invariably be performed, whenever this action takes place, because sometimes at this period the patient is unable to sustain the general action which the operation would produce. We must, therefore, if the patient be much reduced by the extent, or long continuance of the disease, rather delay until, by good diet, wine, &c. we have procured an increase of strength; but, if we find that either the patient loses ground, or his weakness remains stationary under this treatment, we must then amputate; because, it is probable, that the continuance of the dead portion in contact with the living is tending to induce still the general action of descent.\*

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\* As an illustration of this rule, I may mention the following case: A man, during a voyage to a cold climate, had both his feet frost-bit, in consequence of which mortification ensued. In this state he continued for two or three weeks, during which he received very little medical aid. When I saw him, both his feet

When we do not deem it advisable to amputate very soon after the induction of the ulcerative action, it is sometimes useful to cut off part of the black mortified portion, or perhaps to remove a joint, by cutting through the remaining ligaments. In this way, we lessen the fœtor, and make the patient more comfortable.

After making these observations on mortification, I shall conclude with the following case :

A young woman, who lived at a considerable distance from Glasgow, was in May 1797, seized with erysipelas of the right foot and leg, which, by her account, had been extremely violent, and very much neglected. On the tenth day of the disease she was brought to town, and admitted into the hospital. The foot was quite cold, the leg livid, and extremely painful. Pledgets dipped in camphorated spirit of wine, were applied to the parts, and bark, wine, and opium, were prescribed, together with oranges, &c. and gradually increased in quantity, until at last she came to drink, besides soup, a couple of bottles of wine daily, at the same time that she took eight grains of opium, and a very considerable quantity of bark, in the twenty-four hours. By these means, the pulse was soon brought down from one hundred and forty to one hundred and eighteen strokes in the mi-

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were mortified, from the toes to about three inches above the ankle joints, his pulse was feeble, very frequent, and intermittent, the strength was greatly impaired, and the countenance sunk and ghastly. The ulcerative action had been induced for some time, but the want of wine and proper diet had prevented the system from gaining by the cessation of the local disease. He began the use of the bark, opium, wine, and soups, which he took very liberally, in consequence of which his pulse became slower, and his strength increased. In two days, one of the ankle joints was removed by clipping through the tendons, and, in a few days more, the other came away. Amputation was now performed below the knee of the right leg, the constitution, instead of gaining, rather beginning to lose ground. The subsequent affection of the system was by no means great, and, in about a week, he was much stronger; but, as the bones of the ankle joint of the other leg were carious, he again began to sink. Amputation was therefore performed on the left side, in about three weeks after the first. During the cure, the wine, opium, and nourishing diet, were freely prescribed.

nute; but it was not until twenty days after her admission that the ulcerative action was evidently induced. The quantity of the medicine was now gradually diminished; and, in a few days more, the separation being complete, the limb was amputated above the knee. During the operation, I paid particular attention to the saving of blood; and the circulation being destroyed in the parts below the knee, there was scarcely any lost. At this time, she was still taking a bottle of wine, with a considerable quantity of bark and opium, daily. The wine was omitted after the operation; but she had a drachm of laudanum, and continued to take the bark. In the evening the same quantity of laudanum was repeated. Next day she was quite easy, and had slept well; the pulse beat only one hundred in the minute. On the third day the stump was dressed, when it was found (as was to be expected,\*) that only a very imperfect adhesion had taken place: One of the corners was also livid. The bark was therefore freely continued, and six ounces of wine added daily; but the pulse having, on the fifth day, risen to one hundred and ten, and the spot becoming of a darker colour, she was allowed a pound of wine, which made the pulse fall, and soon produced a separation of a small slough. In a short time she went to the country cured. During the whole period of the cure, the opium and wine which she took produced neither stupor, nor the slightest appearance

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\* It is very seldom that a stump unites at first, if amputation be performed on account of mortification; at least if the operation be not delayed until the health and strength be fully re-established: But this can very seldom be the case; for, in most cases, the state of the bones, and the disease of the part itself, prevents recovery from taking place beyond a certain degree, and also prevents us from delaying beyond a limited time. The system, therefore, is not allowed to recover fully from the tendency to the action of descent, and union does not take place. In the case which was formerly mentioned, the first stump did not adhere fully, but the second succeeded better, because then the system suffered more from the state of the diseased bones, &c. than from the previous mortification, and, therefore, it had not the same inability to undergo the healing action.

of intoxication. I at one time, when the pain had for a couple of days been moderate, was willing to ascertain the effects of a milder preparation than the camphorated spirit, and substituted proof spirit in its place ; but, in an hour, it was obliged to be renewed, the pain having greatly increased.

*Of the Treatment of the Inflammatio Assuefacta.*

After the inflammatio valida has continued for a considerable time, if neither suppuration, nor any other termination be induced, it is very apt to be converted into the state which has been called passive inflammation, or which, on account of its most frequent cause, I have called the inflammatio assuefacta. This action is, in several respects, different from the acute inflammation, and resembles it only in its general appearance. It may, therefore, in one respect, be considered as a termination of inflammation, being, strictly speaking, a new action, or spurious inflammation.

This action succeeds the acute inflammation, sooner or later, in different places ; and, when once induced, each succeeding inflammation of the same part is apt very quickly to terminate in the same condition ; or, if the renewal of the inflammation be very frequent, this is at last induced without any previous acute inflammation.

A state somewhat similar to this, if not exactly the same, precedes acute inflammation, as well as follows it ; for, during the period which intervenes betwixt the first formation of the action and its perfection, the part remains in this state. We can sometimes observe the augmentation and diminution of the redness and pain during the systole and diastole of the arteries ; and, by the use of the same remedies which cure the inflammatio assuefacta, we can sometimes prevent the farther progress of the disease.

Thus, pepper boiled in milk, is frequently used by the country people as a cure for cynanche, during its incipient stage.

Bleeding, saturnine applications, and the other remedies which are useful in the *inflammatio valida et acuta*, are hurtful here, and increase the disease.

The *agentes similes*, on the contrary, are useful, and may be used internally, or topically.

Internally, the bark, wine and opium, with good diet, ought always to be employed, if the part affected be very delicate, and sympathize greatly with the constitution, or if the extent of the disease be great.

Locally, stimulating applications are the proper remedies; and the strength and nature of these must depend upon the natural or acquired delicacy of the part.

When the skin, or cellular substance, is affected with the *inflammatio assuefacta*, spirit of wine by itself, or with the addition of a little camphor, is a very useful application.

When the skin is not directly affected, but only the parts immediately below it, as, for instance, the muscles in chronic rheumatism, or the articulating surfaces of joints, we may sometimes, by applying cloths dipped in laudanum, or strong diffusion of opium, propagate, from the surface to a certain distance, the narcotic action, and alleviate the disease; but, most frequently, we are obliged to trust entirely to the effect of the sympathy of equilibrium, diminishing the action of the internal parts, without any considerable change of nature, by increasing that of the surface. Blisters and rubefacients, such as volatile linamentol. terebrinth. cum camphora, &c. are the remedies for this purpose.

The *inflammatio assuefacta*, when it affects delicate parts, covered only with a thin skin, such as the throat, forming one of the most frequent species of cynanche, is cured by

gargling with port wine, infusion of capsicum, and similar remedies.

When it affects the eyes, the use of stimulating and opiated preparations have been long in use. The following is one of the best:

R. Vini Albi uncias duas.

Opium drachmam.

Pulv. Gall. scrupulum.    Macera per dies tres deinde cola.

A drop or two of this may be let fall into the eye three times a day.

Electricity is recommended in the cure of this kind of inflammation; but this, as well as heat, are doubtful remedies; for both seem to increase actions without changing them, except in so far as the change depends upon an increased degree. Cold, on the other hand, lessens the power of recovery, if carried to any great degree; but, when slight, it assists the operation of other remedies, by lessening the performance of the existing action, which is morbid. All applications, therefore, ought in general to be a little below the temperature of the part.

Whenever an inflammation does not manifest a tendency to any other termination, but continues stationary, or perhaps becomes worse, under the use of the remedies which we employ for the cure of the *inflammatio valida*, we may consider that this action (or the *inflammatio assuefacta*) has taken place, and that the nature of our applications must be changed. Bark and wine, with anodynes, may be given internally, whilst, if the situation of the part permit, suitable applications must be made to it. By continuing this treatment, we frequently resolve the *inflammatio assuefacta*; but, occasionally, it becomes again converted into the true acute

inflammation, in which case the continuance of the same remedies will do hurt. The appropriate local remedies, such as cold, saturnine preparations, &c. must be had recourse to, if the part be external, whilst, if the pulse become hard, and more frequent, or fuller, general remedies, such as bleeding in small quantity, may be useful ; but both local and general remedies must be used with moderation, and pushed only a certain length, otherwise we defeat our intention, and again speedily induce the inflammatio assuefacta, by interfering with the powers of recovery. If this happen, we must again have recourse to the proper remedies.

## DISSERTATION III.

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### ON THE PHAGEDENIC, AND SOME OTHER SPECIES OF SPECIFIC INFLAMMATION.

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WHEN any peculiar modification of the inflammatory action takes place, specific inflammation is said to be produced ; that is to say, the action possesses some peculiar or specific qualities, independent of the simple condition of inflammation ; and these are generally productive of evident and visible effects, which are characteristic of their presence ; but, until these effects, which are chiefly observable in the appearance of the consequent ulceration, appear, it is frequently impossible, from the symptoms of the inflammation alone, to say that it is specific ; because the evident effects, or symptoms of the inflammatory action, such as heat, pain, redness, &c. admit of few specific alterations, varying only in degree, and this variation taking place often without any specific affection of the action.\*

The effects of the ulcerative action admit of greater variations than those of the inflammatory, and, therefore, more readily show the presence of specific action. The healthy ulcerative action exhibits certain appearances which have been al-

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\* In most specific inflammations, if not in every one, the redness is never of the bright scarlet colour, but always more or less purple, or dusky ; but this may take place without any specific action. The sensation is also sometimes different.

ready described, and which are easily known. The simple deviations which have been treated of, in considering the different genera of ulcers, are also discoverable by the effects, or peculiar symptoms. The specific deviations dependent upon the presence of previous specific inflammation, or the application of a morbid agent, after simple ulceration has been induced, may also, in many cases, be detected and ascertained, by the variations which take place in the aspect of the sore, the appearance of the granulations, discharge, &c. ; but these variations and appearances consist so much in peculiar hues and qualities of the granulations, which we have no words to convey an idea of, that it is impossible to give an accurate description of a specific sore, but must see it in order to obtain an idea of it. We may indeed say, that a sore is ragged, has a fiery look, is surrounded with an erysipelatous margin, and discharges a thin foetid matter, but still we shall not convey the idea of the specific appearance of the ulcer.

It is this specific appearance alone which characterizes a specific ulcer ; and this, in each peculiar ulcer, is different ; and a knowledge of it can only be obtained by an attentive examination of many sores. On this account, it is extremely difficult, in many instances, to distinguish a specific ulcer, because the discrimination depends altogether upon the recollection of the practitioner, and the improvement which he has made of his former observations. It is indeed, it may be thought, an easy matter to distinguish a simple ulcer by negative characters, or the want of the peculiar aspect ; but, as this aspect is very arbitrary, and as the appearance of simple ulcers is, as has been already described, very various, it is difficult to say, without much judgment, whether the sore be simple or specific ; for the appearance of the one and of the other run imperceptibly into each other. Even if it be ascertained to be specific, it is difficult often to distinguish betwixt particular specific diseases, in so much, that

many are forced to take mercury for the cure of syphilis, who never had that disease.

Besides the appearance of the sores, specific action likewise produces a perceptible effect upon the scab which covers them, or the cicatrix which is formed. Thus, scrophula is marked by a particular appearance of the cicatrix, or of the scab. The venereal ulcer has likewise a particular scab, and many cutaneous ulcers are best distinguished by the scab. Other actions produce no considerable ulceration, but only successive desquamation of the cuticle.

We may also sometimes discover specific action by the sensation of which the action is productive. Thus, for instance, cancer produces a burning kind of pain, which never attends simple ulceration.

Specific ulceration is also always surrounded with more or less simple inflammation, or erysipelas, of the surrounding skin. In some cases the margin is hard, in others ragged, &c.

It were much to be wished, that some more certain, and less arbitrary criteria, than those which we possess of the presence of specific action could be discovered; but, as yet, we know of no other which can be applied universally. Some kinds, indeed, are so well marked, and so peculiarly distinguished from simple sores, that they can be tolerably well described, and easily discovered to be specific; but, there are others which it is more difficult to ascertain, owing to the difficulty of fixing the character of each individual action.

The number of specific inflammations is very great, and the causes which produce them are often obscure. In the preliminary dissertation it was mentioned, that, whenever any action existed strongly in any one part, it tended to induce an inflammatory state. There are, therefore, no general, or febrile diseases, which may not be attended with pe-

cular inflammations. That typhus fever is attended with local inflammatory action is pretty certain; but the presence of specific inflammation is still more evidently seen in the different exanthematous diseases. The diseases called cutaneous, afford us also numerous instances of specific inflammation.

From the difficulty of discriminating betwixt diseases, which, although essentially different from each other, yet possess a very great similarity, we find, that the number of specific inflammations is confined much within the true limits; for we find many confounded under the name of herpetic, &c. which are radically different from each other.

Phagedena has been used by medical writers in a very extensive sense, and has been made to comprehend diseases, which, strictly speaking, cannot be considered phagedenic.

The phagedena is a suppurating sore, dependent upon the application of a peculiar contagion. No granulations are formed, but both sets of vessels yield a thin fluid. The surface of the sore has a jagged appearance, dependent upon the irregularity of the absorption, and not upon the deposition of organic particles, or granulations. The colour of the surface is dark, but clear, or fiery. The surrounding integuments are erysipelatous. The discharge is thin and serous, and the pain considerable. This is divisible into two varieties: First, the true phagedenic, which does not go deeper than the skin, but spreads rapidly along the surface. This kind frequently stops in its progress suddenly, and skins over as fast as it spread. Second, the noma, or penetrating phagedena, which extends deeply, penetrating sometimes perpendicularly down through the cellular substance to the muscular fascia; at other times, proceeding more irregularly, penetrating deeper at one part than another, and having its margins ending less abruptly in the neighbouring skin. This never cicatrizes rapidly; but, sometimes, when the sore as-

sumes a healing appearance, it suddenly becomes again diseased, and a considerable portion sloughs off. The alternation of proceeding a certain length in the cure, and relapsing, is frequently repeated, and often renders the disease very tedious.

The best application for the common phagedena is an ointment consisting of an ounce of ung. resinos. and a drachm of red precipitate.

The application of caustic to the surface also frequently stops the progress of the disease.

The hepatized ammonia, much diluted, is also very useful as a lotion.

The penetrating phagedena is more difficult to cure; for even after the diseased action is removed, the ulcer remains in an irritable, or overacting state. The application which I have found most useful is powdered opium, mixed with simple ointment, in the proportion of two drachms of the former to an ounce of the latter. After the phagedenic action ceases, the sore must be treated according to the genus of simple ulcer to which it belongs.

When the sores seem to pursue their ravages obstinately, the most effectual mean of stopping their progress (until we discover a specific remedy, or one which can change the nature of the action,) is to apply the caustic to every part, and so freely, as to produce a pretty thick slough. Whenever this appears to separate, precipitate must be applied, in order, if possible, to prevent the recurrence of the diseased action.

When any considerable vessel is eroded, by the continuance of this disease, it must be tied beyond the diseased part; but we must be careful that no matter from the sore gets upon the wound, otherwise it will become diseased also. I have a preparation, in which a part of the femoral artery was opened at the groin by this kind of sore, which succeed-

ed a venereal bubo. No operation, I understand, was attempted, but compression alone used. The man died in a short time. Whether tying the iliac artery, by cutting through Poupart's ligament, would have saved him, is difficult to say.

The true phagedena seems always to confine its action to a particular spot ;\* but many of these diseases, which have been described under the same name, appear to be capable of inducing a general action, similar to the venereal disease, affecting different parts of the body in succession. A case of this kind is related by Mr. Adams, in his *Observations on Morbid Poisons*: A gentleman who had a small pustule on the prepuce, squeezed it so as to make it burst, and soon afterwards had connexion with a woman whom he had long known. The sore remaining without healing, he applied a solution of caustic, and had recourse to mercurial frictions. But, notwithstanding these, the ulcer spread, and soon reached the scrotum. The mercury was now laid aside, and bark, with a good diet, was substituted, after which the ulcer put on a healing appearance ; but, before cicatrization took place, a feverish fit supervened, with violent pain in the part. In the course of a short time, however, the unfavourable symptoms disappeared, and a healthy condition was again apparently induced. These paroxysms of fever, and subsequent amendment, alternated with each other for a considerable time, and each relapse was preceded by a livid appearance round the sore. These appearances at last went off, and the sore assumed more the aspect of the true phagedena. The cicatrizing process now began at the upper part, and proceeded rapidly until almost the whole sore was covered. But, nearly about this time, copper coloured spots

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\* The neighbouring glands sometimes swell and suppurate, but they heal kindly, and the disease proceeds no farther.

appeared on the hands, and the inside of the right thigh ; and, in a day or two afterwards, an ulcer appeared in the throat, with "bumps" on the head. Shortly afterwards a node appeared on the tibia, and the patient became bandy. The blotches speedily began to ulcerate, and another appeared on the sternum. Mercury was now given freely, and at first with apparent success, for the ulcers looked better, and no new affection appeared ; but, whenever the mercurial action was beginning to be fully induced, the granulating appearance of the surface was destroyed, and it became of a dusky colour, discharging "bloody sanies." The bones remained stationary. The medicine was now discontinued, and the patient went to the country ; but, on his return, in about a fortnight, "his throat was again ulcerated.\* Such of the old external ulcers as had not healed, threw up a kind of fungus granulations." The sore on the penis, which never had been completely well, had spread to the size of a shilling, but had no phagedenic, or specific appearance. Mercury was afterwards tried, and some bones exfoliated from the nose. The ulcer healed ; but, as soon as he recovered from the effects of the mercury, new blotches and ulcerations, with a new enlargement of the tibia, took place. "He is now under his fifth mercurial course."

In this case, mercury evidently was prejudicial, except toward the end. It does not appear that the caustic had been freely applied to the original local disease, which might have destroyed it. These affections, which were by some considered as venereal, evidently differed from that disease, in the rapidity of its progress, in the appearance of the primary sore, and in the history of the whole of the symptoms. We are as yet in the dark with regard to a specific remedy for these, and similar affections.

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\* From this, it would appear, that his throat had been at one time healed.

There are several other ulcers, which appear upon the penis after coition, which probably depend upon the application of a peculiar contagion. These\* are sometimes superficial and phagedenic ; they spread fast, and heal rapidly, frequently in the course of a night after precipitate has been applied. At other times they are deeper, and more like a little cup ; the surface is smooth and glossy, without any appearance of granulations ; the discharge is thin, and the base and margin quite soft. The best remedy is the caustic, with the subsequent application, precipitate, or ung. hyd. nit. dilut. When buboes form, I have always found them heal without the use of mercury. If, however, the bubo be the first symptom which appears, as is sometimes the case, (for the morbid agent is occasionally absorbed before it excites action in the part to which it is applied,) then it is generally much more difficult to heal than when it is preceded by a local action, and induced by the absorption of matter generated there.

If these local, or primary symptoms, be not speedily removed, a general disease is induced, as we see in the case already mentioned, and as is proved by numberless other instances. These general affections are marked by ulcerations of different parts ; and the ulcers have a different appearance, according to the nature of the morbid agent. In some cases they are better and worse at intervals. Mercury has, in almost all these cases, been used ; but, although some are ameliorated by it, yet others resist its action. At first, indeed, they generally appear to heal ; for the mercurial action, when forming, interrupts the progress of the former diseased action ; but, whenever the mercurial action is fully

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\* Many of these have been confounded with the venereal disease, and treated accordingly.

It were much to be desired that they should be accurately described, and one kind distinguished from another, for there are probably many different species.

induced, we sometimes find that the appearances change, and the progress generally becomes quicker than formerly.\*

There is a disease which is not unfrequently confounded with syphilis, but which is distinct from it; I mean small ulcers about the mouths of children, which are more like aphthæ than any thing else; but, soon after their appearance, small blotches appear in the body, which become first raised into a little flat vesicle, and then ulcerate superficially. These ulcers have a watery appearance, not much unlike tetter: but the appearance of the vesication, and dark colour of the preceding blotches, prevent any confusion. Nurses who suckle these children have generally small calyciform ulcers on the nipples, of a pale colour, and discharging a thin watery matter. I have had no opportunity of ascertaining what constitutional symptoms would be produced by the continuance of the disease in the nurse, as I have generally found that the application of diluted citrine ointment to the nipple produced a cure, without any internal medicine. The constitutional symptoms in the children were cured by the same local applications, with small doses of calomel internally.†

I have likewise observed ulcers on the lips, throat, and mouth, which at first had a very doubtful appearance; but

\* Some actions cannot be induced during the continuance of others. Other actions can, in these circumstances, be formed, and displace completely the former action. A third set seem to give a modification to the original disease: They change it to a certain degree; but the change is not salutary, and they never displace it. The mercurial action, when induced during the existence of some of the diseases which I am describing, comes under the last, or third class. At first, during the formation of the mercurial action, the former diseased action is interrupted, in the same way as the natural action is injured during the period of formation of other actions, when no peculiar disease previously existed. On this account, the sore assumes a better appearance; and, if the action be nearly terminating naturally (as some actions do, and as the primary action in these diseases more readily does than the secondary,) it quickly heals up; but, if this be not the case, the appearances soon change, and the disease becomes much worse.

† There are some cases, described by different authors, of affections of the nipples and breasts, in which the ulcers appear to have been chiefly of the phagedenic kind

they evidently are distinct from syphilis, and belong to the suppurating sores. When superficial, the buff-coloured matter, or inorganised substance which covers them, has a fibrous, or thready appearance, the margins are slightly tumid, and of a florid, or kind of pink colour. The application of caustic, or burnt alum is often sufficient of itself to cure these; but small doses of mercury sometimes accelerate the cure. At other times these sores penetrate deeper, and affect the bones. The surface, which is deep, is covered with a thick yellow slough, like an overacting ulcer. The margins are tumid, ragged, and of a light, or pink colour. Sometimes the disease spreads along the gum, which becomes soft, ulcerated, and separates from the teeth, which very frequently become black, and, when the sockets are affected, drop out. I have not had an opportunity of observing these sores go the length of inducing constitutional symptoms. It is not easy to ascertain the cause of these sores; sometimes they succeed the use of mercury; but at other times, it is impossible to blame any evident agent. The transplanting of teeth sometimes has been the mean of inducing sores similar to these; and, in these cases, the disease has generally passed for syphilis.\* But although the venereal disease may have been inoculated in this manner, it is certain, from the appearance of the ulcers, from their rapid progress, and from the sudden effect produced by a very small quantity of mercury, that the disease, which is commonly induced by transplanting teeth, is not syphilitic.

Sibbens is another disease which has been very frequently confounded with syphilis, and is by many considered to be only a variety of that disease; but they evidently are different, as appears from the mode of infection, and the properties

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\* Cases of this kind may be found in Mr. Hunter's Treatise on the Venereal Disease, and in the third volume of the Medical Transactions

of the contagion,\* the appearance of the ulcers, their progress, and certain circumstances in their cure, particularly their requiring less mercury than venereal ulcers in the same state, and from their yielding readily to preparations of mercury, which do not accomplish a cure of syphilis.

This disease appears first on the part which is most directly acted on by the contagion. This part becomes red and inflamed, having an erysipelatous appearance. Ulceration quickly takes place on a particular spot, and spreads rapidly along the whole inflamed part. The disease then advances more slowly ; the erysipelatous appearance spreads around the margin of the ulcer, and ulceration follows upon the inflammation. In the course of some time (the precise period is not fixed,) the skin becomes affected with blotches, or sometimes clusters of small pustules, the intervening space betwixt each being affected with an erysipelatous inflammation. These spots soon ulcerate, and the surface rises up into a fungous, which is irregular, and has an aspect somewhat betwixt the look of the venereal sore and a very bad scrophulous ulcer. The bones next become affected, particularly at the articulating surfaces, which swell, and become carious. It is said that the secondary ulcers in general appear first upon the genitals ; but, of all those whom I have examined, no affection of these parts had taken place, from which I would infer, that the disease has no peculiar tendency to affect these in preference to other parts. It is likewise said that the disease sometimes disappears from one part, whilst it breaks out in another ; but this also I have never witnessed. The primary ulcers also have no tendency, like some others, to change their appearance, and become

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\* This disease is communicated even by drinking out of the same vessel with an infected person, even although that person, have no sores on the lips, but only in the throat. The contagion then must either be dissolved in the saliva, or remain very powerful, even when reduced to a state of halitus.

milder, or heal by continuance, but spread, destroying the nose, orbits of the eyes, and face. The constitution seems to suffer much more from this disease than from syphilis, in the same length of time; for the patient soon assumes a pale sallow look; and hectic comes on much sooner than in syphilis.

The cure of this disease is effected by washing the sores with solution of corrosive sublimate, or dressing them with precipitate ointment, at the same time that we use mercury internally, without which no escharotic, or local application whatever will effect a cure. In general, less mercury cures this disease than syphilis; and it is worthy of remark, that permanent cures may be obtained by the hyd. mur. corros. which is not the case with syphilis. When the bones are affected, we must, in conjunction with the specific remedy, use such applications as the state of the bone, considered as a simple affection, will require.

The cynanche maligna, and scarlatina, are also diseases producing ulceration in the throat. The sores are of the suppurating kind, a thick lymphatic-looking, or inorganized substance being thrown out, instead of organic particles, or granulations. This, in the former disease, very soon becomes black, and putrefies; but the slough so formed differs materially from that caused by gangrene; for, in this disease, unless in the very last stages, there are no real gangrenous sloughs. It is unnecessary here to make any particular observations on these diseases.

Herpes\* is a disease which is very frequent, and often prevents large ulcers from healing, as these come to assume the action of herpetic ulcers, although, from their magnitude

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\* There are many different divisions of herpes; as, for instance, into the scurfy, scabby, miliary, &c.; but, for a description of these, I must refer to the writers, on the diseases of the skin.

and depth, they do not put on the same appearance as when the disease is confined to the skin. The large ulcers are of a dark sloughy appearance, discharge thin matter, are painful, and are surrounded with herpetic ulcers, and scabs in the skin. This is a very frequent disease on the legs, and is very tedious. Bathing with warm sulphureous water is often of service, at the same time that we dress the parts in the intervals with camphorated ointment. Citrine ointment is also very useful; but the following liquor is one of the best, and most effectual applications :

R. Pulv. Calcis Vivi Recen. unciam.

Flor. Sulph. semiunciam.

Aq. Font. sesquilibram. Coque ad dimidiam dein cola.

This ought to be applied with cloths to the parts.

When, by these means, the disease of the skin, and the specific action of the ulcer is removed, pressure is often of service in completing the cure.

There is a specific ulcer, which is met with most frequently on the legs, and which is very troublesome. The skin becomes in several points inflamed, or of a dark red colour. These parts speedily ulcerate, and the sores belong to the suppurating kind, for no distinct granulations, or organic particles, are formed; but the surface is smooth and glossy, and the discharge thin and copious. These sores are generally pretty deep, in proportion to their extent, or of a cup-like appearance. They not unfrequently occur in scrophulous habits. Mercury, exhibited in small doses internally, appears to be useful. Precipitate, as a local application, generally answers very well; but, when the sores become irritable, or spread under this treatment, hemlock poultices succeed better.

There is a small ulcer, which sometimes is met with on the foot of an irregular shape, fiery appearance, and surrounded with thick jagged margins, which, in particular parts, are white, and callous. The neighbouring integuments are of a dark red colour. The discharge is thin, and the pain considerable. Caustic, and afterwards, the application of the adhesive plaster, are the best local applications. Internally, the use of hemlock is sometimes of service.

It occasionally happens, that, nearly about the same time, most of the patients in a ward of an hospital shall have their ulcers rendered unhealthy. They become foul, dark coloured, and spread: The discharge is thin, and the pain is greater than formerly. The application of cloths dipped in gastric juice is sometimes of service in these sores, and is one of the best remedies; but, not unfrequently, the patient must be removed to a different situation before a cure can be obtained.

Having made these detached remarks on some specific ulcers, I shall, in the succeeding dissertations, consider, at greater length, others, which are, in the general estimation, considered as more dangerous and alarming.

## DISSERTATION IV.

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### ON THE SPONGOID INFLAMMATION.

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THE disease which I am now going to consider, has either not been described at all by any author, or has, when it was noticed, been considered as of a cancerous nature. It is perhaps one of the most alarming diseases to which we are subjected; because, as yet, we know of no specific remedy; and an operation can only be useful at a time when it is very difficult to persuade the patient to submit to it.

I have named it the spongoid inflammation, from that spongy elastic feel which peculiarly characterises the disease, and which continues even after ulceration takes place.

This disease begins with a small colourless tumour, which, if there be no thick covering over it, such as the fascia of a muscle, or the aponeurosis of the foot, is soft and elastic, but tense if otherwise. It is at first free from uneasiness; but, by degrees, a sharp acute pain darts occasionally through it, more and more frequently until the sensation becomes continued. For a considerable time, the tumour is smooth and even, but afterwards it projects irregularly in one or more points; and the skin at this place becomes of a livid red colour, and feels thinner. It here readily yields to pressure, but instantly bounds up again. Small openings now form in these pro-

jections, through which is discharged a thin bloody matter. Almost immediately after these tumours burst, a small fungus protrudes, like a papilla, and this rapidly increases, both in breadth and height, and has exactly the appearance of a carcinomatous fungus, and frequently bleeds profusely. The matter is thin, and exceedingly foetid, and the pain becomes of the smarting kind. The integuments, for a little around these ulcers, are red, and tender. After ulceration takes place, the neighbouring glands swell, and assume exactly the spongy qualities of the primary tumour. If the patient still survive the disease in its present advanced progress, similar tumours form in other parts of the body, and the patient dies hectic.

On examining the affected parts after death or amputation, the tumour itself is found to consist of a soft substance, somewhat like the brain, of a greyish colour, and greasy appearance, with thin membranous-looking divisions running through it, and cells, or abscesses, in different places, containing a thin bloody matter, occasionally in very considerable quantity. There does not seem uniformly to be an entire cyst surrounding the tumour, for it very frequently dives down betwixt the muscles, or down to the bone, to which it often appears to adhere. The neighbouring muscles are of a pale colour, and lose their fibrous appearance, becoming more like liver than muscle. The bones are uniformly caries, when in the vicinity of these tumors. If large, they are found rough, and broken off into fragments; if small, they are generally soft and porous. This tumour is sometimes caused by external violence; but often it appears without any evident cause.

I know of no remedy which has a power of checking the progress of the complaint, or removing it. Friction, with anodyne balsams, sometimes gives relief in the early stages; but it does not seem to retard the progress of the disease.

Extirpation is the only remedy which has a prospect of being successful ; but it is only advisable in the early stages, whilst the disease is entirely local, and has not extended to the neighbouring glands ; for, after they become affected, the chance of recovery is greatly diminished. It is, however, sometimes difficult to persuade patients at this time to submit to amputation, or extirpation, because the pain and inconveniences are inconsiderable ; but the operation ought to be urged with all the eagerness which a conviction of its absolute necessity, and its precarious issue, if delayed, will inspire.

After making these observations, I shall illustrate the subject with the following cases ; the first of which is intended to show the difficulty of extirpating the disease, when the operation is delayed after the first appearance of the tumor. In the second, we see the destruction which the bones suffer by it, and the extent of parts which it may affect. The third gives us an instance of the affection of the glands : And the fourth, of the most advanced stage, or that in which distant parts have suffered. The last is an instance of the good effects of an early operation.

### CASE I.

William Stirling, without any very evident cause, perceived a small tumor on the top of the shoulder, about midway betwixt the termination of the neck and the articulation of the humerus. This gradually increased for some months, and by the time when I saw him was larger than a goose's egg : It was spongy and elastic, and attended occasionally with pain.

Although the duration of the tumor was an unfavourable circumstance, yet I undertook the operation. I made an incision through the whole length of the skin, and dissected

it off the tumor, (the upper part of which was covered with a coat, or cyst,) down to its base; but, when I now began to separate it from the parts below, I found that it had no defined bottom, but penetrated down betwixt the muscles, which were soft, pale, and had lost their fibrous structure. I therefore cut off the tumor close by the muscles, and then separating them with the back of the scalpel, I removed with the finger as much of the tumor as I could observe. Several arteries sprung; but these were pretty readily tied, although the vessels were very tender. A troublesome oozing, however, took place from many points of the diseased muscles. This was moderated by applying the sponge dipped in cold water, after which the skin was laid down, and its lips brought close together.

On dressing the patient on the third day after the operation, the skin was found not to have united; but its lips were red and inflamed. In this state it continued for several days, when the part began to grow tumid, and discharge a thin foetid matter. The skin then retracted still more, and a fungus protruded, which gradually increased; but it was smooth and regular, and of a pale colour, so that it rather had the appearance of a superficial ulcer, raised up by a tumor from below, than the ulcerated surface of a diseased substance itself. In this state it continued for two or three months, when irregular projections appeared on the ulcerated surface of the new tumor. These soon burst, and a fungus protruded, of a carcinomatous appearance, and bleeding very frequently and profusely. Swellings of the axillary glands succeeded this, and the patient became much enfeebled, and evidently hectic. As I have not heard of him for several weeks, I suppose that he has died.

In this case a second tumor succeeded to the first, owing to the impossibility of extirpating the whole, and this exactly resembled the original one, except in having its surface

covered from its commencement with an ulcer; but this ulcer was not the specific one of the spongioid inflammation.

## CASE II.

John Overend was attacked with pain in the right thigh and loins, which were considered as rheumatic. Shortly after the thigh was observed to be elongated, and issues were applied over the hip joint, upon the supposition of its being a common case of morbus coxarius. But no considerable relief was obtained by this; on the contrary, the upper part of the thigh swelled, whilst the lower part wasted, his appetite diminished, his pulse was quickened, and he passed sleepless nights. The thigh was rubbed with anodyne balsam, and draughts with laudanum were given every night, but only with temporary benefit. For the course of some months these complaints continued, with occasional remission and aggravation. At last he began to complain of difficulty in making water; and this soon ended in a complete retention. The catheter was attempted to be passed; but although its point was bent, and directed so as to correspond to any deviation of the prostrate gland from its right situation, it could not be introduced. By examining per anum, a large elastic tumor could be felt in the pelvis, which was considered as the bladder. A trocar was therefore passed up the rectum, and the bladder attempted to be tapped. A considerable quantity of bloody fluid came away; but he complained of no pain at the glands, which most patients do when the bladder is wounded; and a considerable quantity of high coloured foetid urine was voided by the urethra, and continued even afterwards to be passed, although with some difficulty. Within a week after this the patient died.

On dissection, I found the hip joint to be completely surrounded with a soft matter, resembling the brain, inclosed in

thin cells, and here and there cells full of thin bloody water ; the head of the femoral bone was quite carious, as was also the acetabulum. The muscles were quite pale, and almost like boiled liver, having lost completely their fibrous appearance, and muscular properties. On opening the abdominal cavity, the same kind of substance was found within the pelvis ; and the greatest part of the inside of the bones of the affected side were quite carious. Large cells were found in this diseased substance, containing bloody water ; and it was into one of these that the trocar had entered when the bladder was attempted to be tapped.

### CASE III.

James Walker received a stroke upon the outside of the foot, immediately below the ankle joint. A small tumor instantly formed, which continued stationary for several weeks, and gave him little uneasiness ; but afterwards it began to increase, and was attended with a shooting pain. The tumor was elastic, pretty tense, and rather irregular in its appearance. I was anxious to operate, but the man would not give his consent. I therefore advised frictions with anodyne balsam, which at first gave him relief, but soon lost its effect. For several weeks I heard nothing of him ; but, at the end of this time, he again applied to me. The irregularities of the tumor were much greater, more prominent, of a red colour, and one of them had burst : From this a soft half-organized fungus protruded, and a bloody fluid run out constantly. An operation was again urged, but the timidity of the patient made him again refuse. A month after this he came under the management of another surgeon. There were now three openings in the tumor, from each of which protruded a broad cauliflower-looking fungus, covered with thick foetid matter ; there was likewise a thin red serum dis-

charged from the margins of the ulcers. The tumor was as large as a child's head, and one of the inguinal glands was a little swelled. The man now consented to lose his limb, and amputation was accordingly performed. Whenever the tourniquet was applied, a very copious stream of venous blood issued from the tumor; but this ceased when the veins had emptied themselves. Unluckily it was considered as unnecessary to extirpate the diseased gland.

On examining the leg, all the bones of the ankle joint were found to be quite soft and carious; the tumour consisted of a soft substance, resembling the brain, with light membranous intersections. The cyst on the upper part was hard and thick, but beneath it was entirely wanting, having either never been formed betwixt the tumor and the tendons of the muscle, or having been destroyed. The former opinion is the most probable; for I have never in any stage found the cyst continued over the under or back part of the tumor, but it always terminated imperfectly in the part on which the tumor was seated.

The wound healed as well as could be desired, but the gland became rather larger, notwithstanding which no operation was urged. Two months after this I was requested to visit him. The gland was now as large as the head of a new-born child; it was soft and spongy, and had at one part an irregular prominence, but the skin was not coloured. The pulse was about one hundred and thirty, and the patient completely hectic. In this situation I proposed nothing excepting nourishment. He died in the course of a week after I saw him.

## CASE IV.

The following case shows this disease in its most advanced stage. It is extracted from the fifth volume of the *London Medical Journal*, and is intituled, "An Account of the Fatal Effects produced by attempting to remove a Ganglion by Seton." It was drawn up by Mr. W. Dease, surgeon in Dublin.

"In July, 1781, a clergyman, aged thirty-seven, consulted me about a moveable ganglion, of the size of a small nutmeg, situated between the fore-finger and thumb of his right hand, near the wrist. He was eager to have it removed, and had been advised, for this purpose, to have a seton passed through it, as the best and most certain method; but, as he was apparently a robust healthy man, and the ganglion was attended with no pain, I advised him to consider it as a matter of no consequence, and not to meddle with it. Four months after this I was desired to visit him, and found him in a melancholy situation. A seton had been passed through the ganglion, and the consequences were, that the back of his hand had inflamed violently, that the ganglion had rapidly and amazingly increased, and that the openings made by the seton were filled with an ill-conditioned fungus, which sprung up as fast as it was removed, and was attended with frequent hemorrhage, and much pain. In consultation, it was agreed to remove this fungus by a free incision, which was done, and the metacarpal bones appeared bare and rough. Another opening was made through the thenar, and a seton passed through it, in order more effectually to prevent the growth of fungus. The bark was administered in large quantities, an opiate was given at night, and due attention was paid to the regimen of the patient. This method

seemed to promise the most happy event. The fungus appeared to be entirely destroyed, a landable suppuration took place, the swelling of the hand subsided, and the sores in a short time were so contracted as to indicate their speedy cicatrization. These favourable appearances, however, were not of long continuance; for, after some time, the fungus began gradually to rise again, and any mode of keeping it down, either by caustic, cutting, or pressure, seemed to produce no permanent good effect, as it increased rapidly, and at length degenerated into the most frightful cancerous fungus I have ever seen. Every local application that has been recommended in similar cases was tried in this, but without success; and internal remedies proved equally inefficacious. He took, for a considerable length of time, two ounces of bark in substance, in the course of twenty-four hours, so that he took, in the whole, twenty-eight pounds of that medicine. The extract of hemlock had also a fair trial, but produced no apparent effect.

“When he had laboured under this complaint fifteen months, he was advised to undergo the amputation of his hand; but before he would consent to submit to this operation, he chose to have an account of his case transmitted to the Royal Academy of Surgery at Paris, that he might have their opinion of it: The result of which was, that the members of the academy pronounced the fungus not cancerous, but merely scorbutic. This decision, by the by, should make us extremely cautious in delivering our sentiments on similar occasions, without seeing the patient, as much depends on the general appearance of the sores in cases of this sort. The academy were of opinion, that the disease was entirely local, and required only local treatment. For this purpose, they advised that the fungus should be taken down by means of euphorbium, savine, &c. and afterwards washed with salt water. If this method proved inef-

fectual, recourse was to be had to the actual cautery, from the application of which they seemed to expect the most decisive advantages. To this mode of treatment the unhappy sufferer submitted; and, during the space of six weeks, the fungus was almost every day burnt down with the actual cautery; but his complaint all the while continued to gain ground apace; so that being now disappointed in all his expectations of relief from regular practitioners, he had recourse to quacks of every denomination. The arsenic plaster of Plunket was applied, and he was salivated for seven weeks. At length, after undergoing the operation of a variety of nostrums, he again placed himself under my care. In consultation, it was much doubted whether amputation should now be thought of, as the patient seemed to be in the last stage of a cancerous consumption. His limbs were swelled, and his whole habit was wasted by the repeated hemorrhage from the fungus, which was now so increased in bulk as to weigh down his arm, and entirely cover the back of his hand. In short, after every return of hemorrhage, it was apprehended that the next would put a period to his sufferings.

“ The hazard of the operation, and the little chance he had of its proving successful, being explained to him, the unfortunate man earnestly begged to be relieved from so hideous a load, even though he should die under the operation. I therefore yielded to his entreaties, and took off the hand a little above the wrist, in November, 1782, although there was a small indurated gland above the elbow. On dissecting the hand immediately after I had taken it off, the fungus, on being cut, appeared to be extremely similar to the substance of the brain, and to arise from the metacarpal bones of the middle and fore-finger. These bones were in part dissolved, and the other bones of the hand were also in a morbid state.

“ No accident occurred during the amputation ; but soon after it, a colliquative diarrhœa came on, which seemed to be increased by opiates and astringents, but was at length checked with draughts of fixed alkaline salt and lemon juice, swallowed in the act of effervescence. He afterwards took the bark, drank seltzer water, and was allowed a liberal use of wine. The suppuration for some time was ichorous and bad, but he gained strength daily. At the end of seven weeks, the stump was completely cicatrized, and the indurated gland above the elbow had disappeared. He went into the country, drank goat’s whey, bathed in the sea, became very corpulent, and seemed to be in perfect health, but had somewhat of a sallow bloated appearance. He continued well till July, 1783, when he began to complain of pains in his back, attended with rigidity. These pains, as they increased, extended down his thighs and legs, and occasioned him to sleep ill at night. He grew feverish, his pulse beat extremely quick, and his countenance acquired a shining yellowish red colour, an appearance which I have remarked to be characteristic of a cancerous habit. He now began to walk with difficulty. I took a small quantity of blood from him, and found the texture of the crassamentum extremely loose, and the serum in too great quantity. He was very difficult to purge, and unfortunately was under a constant necessity of taking medicines to procure the necessary discharges. Antimonials in a variety of forms were given, and the bark was again tried, as were all the medicines that are usually prescribed in rheumatic cases. Blisters were applied, and issues cut in his thighs, but all to no purpose. He was obliged to take to his bed in August, and never after quitted it.

“ It is difficult to form an idea of the constant and excruciating pain this poor man suffered. Opium, though given in large doses, afforded him but little relief, and at last

none at all. He generally lay on his back, fixed, as it were, to the bed, the least motion occasioning the most intense pain. As the disease advanced, he complained of a difficulty of passing his urine, which was loaded with a viscid mucus, and he once discharged an oblong calculus; but at last he voided his urine involuntarily, and sometimes even his fæces, but the latter only rarely, when he had taken a purgative, which, as I have already mentioned, was required to be of the most active kind, otherwise it produced no effect.

“ During the whole course of the disease, his pulse was rapid, but his tongue was remarkably soft and florid. He was never delirious. Latterly, he spit blood once or twice; his lower extremities became very œdematous, and his back was covered with eschars; but these dropped off, and the sores suppurated and healed kindly. Two months before his death, his pains abated considerably. He died without pain, March 4, 1784, which was about two years and nine months from the time the seton was passed, and a year and four months from the time he underwent the amputation.

“ His body was opened a few hours after his death. The abdominal viscera appeared to be perfectly sound, and of their natural colour, except the liver, which had a small steatoma on its convex surface, but was in other respects healthy. The gall bladder was rather fuller of yellow bile than it is generally found to be. The left kidney was enlarged, and on dividing it longitudinally, much red-gravel was found in its pelvis, and the ureter seemed much lessened. The urinary bladder was contracted, and its coats uncommonly thickened, but no sabulous concretions were observed in it.

“ On each side of the vertebræ lumborum, the lumbar regions were rendered convex by a large cancerous deposition, which elevated the psœæ muscles; and when the cellular

investitures, which were condensed into a cyst, were opened, the cancerous matter appeared in a large quantity, in colour and consistence exactly resembling the fungus of the hand, and not unlike the substance of the brain. The whole weighed about five pounds; and when this was removed, the last vertebra of the back, and the three first of the loins, were found to be in a softened, eroded, and in some parts a totally dissolved state. There appeared not the least mark of ichor, sanies, inflammation, or hardness of the soft parts; nor were the mesenteric glands at all affected. The matter seemed to have been really a cancerous exudation, and to be formed chiefly of coagulable lymph. This cancerous mass seemed to possess a remarkable dissolving power, which was exerted wholly on the bones, and did not as usual in cases of this sort, cause any schirrous hardness of the surrounding soft parts."

### CASE V.

A woman, some time after receiving a blow on the leg, perceived a small moveable tumour. It was soft, elastic, and seated on the outside of the leg, about half way betwixt the knee and ankle joint. I made a small incision through the skin down to the tumour, and dissected it off to its base. I then dissected the substance off from the fascia of the muscle, and brought the skin together with adhesive plaster. It united readily, and the patient was cured. The tumour was soft, like brain, of a greyish colour, and greasy consistence.

## DISSERTATION V.

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### ON THE SCROPHULOUS INFLAMMATION.

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Scrophula is a morbid condition, which has been called the opprobrium of surgery, much more justly perhaps than any other disease, cancer itself not excepted, for even this most dreadful disorder may be removed by an early operation; but the nature of scrophula admits of no treatment equally successful.

From the obscurity in which its causes are involved, and from no certain method of cure being known, I can only make a few unconnected remarks on this disease.

A scrophulous system is generally marked by a fine skin, delicate complexion, light blue eyes, with opake sclerotica, and frequently a swelling of the upper lip. At other times, especially in those who belong to what has been called the melancholic temperament, the complexion is darker, and the skin coarser; but in these, at least when young, the face is generally tumid, and the look unhealthy.

In these systems, as will presently be observed, almost every disease is different, in some points, from the same disease when it occurs in a healthy person; but the action which more decidedly manifests this modification, is the inflammatory, insomuch, that, by some, scrophula and scrophulous inflammation have been confounded; and this disease has been described only in so far as it has appeared conjoined with inflammation. We have therefore almost always in the description of scrophula a swelling of the glands, and subsequent ulceration, or inflammatory affections of other parts of the body, detailed as necessary and essential symptoms.

The scrophulous inflammation is marked by a soft swelling of the affected part, which very frequently is one of the lymphatic glands. The covering, or coat of the gland, becomes slightly thickened, and its substance more porous and doughy.\* The swelling increases, and the doughy feel changes by degrees into that of elasticity, or fluctuation, and a firm stool, or circumscribed hardened margin, can be felt round the base of the tumour. The skin is slightly red. If, at this time, an incision or puncture be made, either no matter, or very little, is evacuated, the lips of the wound inflame and open, displaying a sloughy-looking substance within, and betwixt this and the skin a probe can often be introduced for some way all round. If, however, the disease have been farther advanced, then there is very little elasticity in the tumour, it is quite soft, rather flaccid, and fluctuates freely; the skin becomes of a light purple colour, and small veins may be seen ramifying on its surface. In some time after these appearances are observed, the skin may be felt becoming thinner at one particular part, and here it also generally becomes of a darker colour, then it bursts, and discharges a thin fluid like whey, mixed with a curdy matter, or thick white flocculi. The redness of the skin still continues, but the aperture enlarges in proportion as the tumour subsides, forming the scrophulous ulcer. The margins are smooth, obtuse, and overlap the ulcer; they are of a purple colour, and rather hard and tumid. The surface of the sore is of a light red colour; the granulations are flabby and indistinct; and the aspect is of a peculiar kind, which cannot be described. The discharge is thin, slightly ropy, and copious, with curdy-looking flakes. The pain is inconsiderable.

When this ulcer has continued for some time, it either begins slowly to cicatrize, or more frequently the discharge

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\* When the conglomerate glands are affected, the tumour is generally hard and firm until matter forms.

diminishes, and becomes thicker; it then hardens into an elevated scab, of a dirty white, or yellowish colour. This continues for a considerable time, and then crumbles off, leaving the part covered with a smooth purple cicatrix. This description corresponds to the mild scrophula, or the struma mansueta of the older writers; but occasionally, especially if a bone be diseased below the ulcer, the sore has a more fiery appearance, the surface is dark coloured, the margins soft, elevated, and inflamed, and sometimes retorted. The discharge is watery, the pain very considerable, and the surrounding skin inflamed. This has been called the struma maligna, and was said to be marked by the greater degree of hardness and inequality in the tumour, varicose veins, and pulsatory pain: It was likewise said to be contagious. But although occasionally this state of the scrophulous ulcer be preceded by a hard and painful tumour, yet it is not necessarily so, but rather seems to depend upon a disease of the parts below, which generally are bones, cartilages, or tendons in a morbid state; and hence this overacting scrophulous sore is most frequent over the smaller joints, particularly the toes.

Sometimes the scrophulous abscess, after bursting, forms a sinus, the mouth of which ulcerates, and assumes the appearance of the specific ulcer; but the track of the sinus remains in a suppurating state. This not unfrequently is connected with a diseased bone, or cartilage, or tendon.

Scrophulous tumours and ulcers more readily disappear during the winter, and return again on the approach of summer; but this is by no means an universal law of the disease.

It is likewise observable, that swellings of the glands are very apt to subside pretty rapidly in one place, and appear equally quick in some other glands, in the vicinity of those

originally affected. Ulcers likewise frequently heal upon the appearance of the disease in other parts.

When the joints become affected, the cartilages swell, and the quantity of the lubricating matter is increased ; the tendons are surrounded with a glairy matter, like the white of egg ; and, lastly, the bone becomes enlarged. These effects are attended with stiffness and pain in the joint, which is sometimes intolerable, especially during the night, and confined to a single spot, from the disease residing chiefly there. In some time after this, small abscesses form in different parts of the inflamed joint, which gives it a spongy elastic feel. These bursting into one another, form a larger cavity, which communicates with the articulating surface of the bones, and reaches to the skin, through which a fluctuation may be felt. This abscess at last bursts, and discharges a curdy matter. Long before this happens, the bone generally ulcerates, and becomes rough. This disease is uniformly attended with hectic, which terminates the patient's misery.

Not unfrequently, in scrophulous people, eruptions appear on different parts of the body, especially on the face, which is covered with pustules of a dark red colour, suppurating slowly, and sometimes never.

At other times, we find incysted tumours on different parts of the body. These may appear in any habit ; but when they occur in scrophulous people, they assume the specific action of the constitution ; in which case, instead of containing an uniform fluid, like thin jelly, of a yellowish colour, as the simple incysted tumour does, they are filled with a thick curdy purulent-looking matter, or with serum, containing white flakes, or little lumps, of a white substance.

All the causes capable of inducing simple inflammation will of consequence induce the scrophulous inflammation, provided that the inflammation be not induced in such a way, and in such organs as make it heal rapidly, as will be

afterwards noticed. Specific inflammation is likewise modified when it takes place in a scrophulous constitution, and is much more tedious in its cure. This is evidently seen in the small pox and venereal disease.

Although the effects of a scrophulous constitution, in modifying action, be most distinctly observed in the inflammatory action, yet it does not operate exclusively on this; on the contrary, we find, that typhus fever, and some other actions, which may exist without any perfect local inflammation, are, *cæteris paribus*, more violent in scrophulous habits than in others.

This constitution is more easily acted on by certain agents, particularly such as tend to induce inflammation, than healthy constitutions in the same circumstances. It would likewise appear, that, on the contrary, there are other agents which operate with more difficulty. It is in general observable, that scrophulous people are less easily affected with mercury. On a few, indeed, it operates readily; but, when we attend to the general habitude of these people, we must consider the aptitude of some individuals to assume the mercurial action to depend on some peculiarity of constitution, unconnected with the scrophulous condition.

By the ancients, and many of the moderns, the pituita was considered as the cause of scrophula, producing tumefaction, by stagnating in the glands. When any of the bile became mixed with the pituita, then the inflammation was more violent, and the ulceration deeper. Some latter writers, convinced that a simple redundancy of any particular humour could not produce scrophula, had recourse to the supposition of an acrimony, which was productive of swelling and ulceration, and which might "taint the whole fluids of the body."\*

Others attempted to explain this disease, upon the principle of debility existing in the whole body, but particularly in the lymphatic system.\* This is an idea still more puerile than the doctrine of morbid humours, which, however unfounded, had several plausible arguments to support it, and which was incontrovertible until the laws of the animal economy were better understood. Simple debility never can give rise to the marks of the scrophulous constitution; it cannot produce ulcers of a nature and appearance so peculiar; neither can it explain why particular parts are more apt to be affected than others; because, if debility exist equally in every part of the absorbent system, then every part ought to be alike diseased; and if it exist only in particular parts, then it is necessary to point out some cause of this partial debility. We likewise frequently observe very great debility in this system, owing to general weakness, and yet no symptoms of scrophula appear in consequence.

Scrophulous people possess a peculiar constitution, and may therefore be said to constitute, in one respect, a distinct variety of the human race. This state is produced by a peculiar condition of the semen (owing to the peculiarity of the system which forms it,) or of the female organs of generation, which possess the same general nature with the body, of which they form a part. When the organs of generation in both sexes are healthy, that is to say, similar in nature to what may be considered as the proper nature of the human race, taken as a distinct class of animals, then the semen stimulates the ovarium to the formation of a healthy child, or one which possesses a constitution, or susceptibility of performing, and having actions induced in it, similar to that of the majority of mankind. In this process, the ovarium is to be considered as a gland, and the semen as its

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\* Bell's Treatise on Ulcers, p. 421.

peculiar stimulus. If, however, either the nature of the gland, or of its stimulus be changed, it is evident that the action induced must be more or less modified, and the secretion or product changed to a greater or less degree in its nature and properties. Were it possible for a progeny to be produced by an intercourse betwixt the human and the brute creation, they would possess a nature different from both, or perform actions of a mixed kind. This may be observed with regard to mules among brutes. In the same way, a healthy and scrophulous person must produce a child which differs from a healthy one, in having a certain peculiarity of constitution.

Agents produce different effects in different animals ; thus the matter of cow-pox applied to the cow and to man produce very different appearances. Agents likewise, in the same genus of animals, produce different effects, according to the peculiar constitution of the individual. Thus, the matter of small-pox in some men produces only a slight local sore, whilst in the generality it produces a general disease, and eruption. The same disease affords an instance of changes taking place in the constitution after birth, by the establishment of certain actions ; for it is rendered unsusceptible of the same action being induced afterwards ; and, in this respect, is brought to resemble the constitution of a different genus of animals, with regard to that disease. There are some constitutions, such as those called irritable, in which certain symptoms of febrile, and other actions, are much more violent than in people of a different description. In them, for instance, typhus fever is attended with a very frequent pulse, and yet the other effects of this action are not violent in the same proportion.

Peculiarity of constitution is often manifested by no evident sign, and the modifications of actions induced are often marked by no perceptible diseased phenomena, which may

be considered as belonging exclusively to that constitution; But, in the scrophulous constitution, there are, in almost every instance, perceptible modifications of the formative action,\* producing a peculiar appearance of the eye, countenance, &c. as has already been mentioned; and although some diseased actions, which receive modifications from this peculiarity of constitution, may not be attended with obvious alterations, yet others, especially such as are attended with an inflammatory condition, are distinctly changed. It is these changes which constitute what in common language has been called scrophula, which is merely a peculiarity of a common action, (namely, inflammation,) which is dependent, not upon any particular nature of the agent or exciting cause, but upon the peculiarity of constitution, which is susceptible, by these agents, of such an action.

From what has been said it will appear, that I consider the scrophulous inflammation, or what has in common language been called scrophula, merely as an accidental circumstance, occurring in a scrophulous constitution; but it is by much the most dangerous and troublesome effect of the peculiarity of constitution. It has likewise a very evident effect in increasing this condition of the system; for we find, that the probability of scrophula appearing in a child is, *cæteris paribus*, correspondent to the presence or absence of scrophulous inflammation in the parent; or, in other words,

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\* The morbid condition of the formative action is very frequently manifested in the bones, which are less perfect, that is to say, softer, containing less calcareous earth, and later of being formed. Thus, the teeth are longer of appearing; the bones of the head are soft and yielding, and hence the head is large; the long bones bend and lose their shape, or their extremities swell, and, from being more vascular than their nature is fitted for, inflammation is very apt to be induced. The yielding and increasing of the bones of the cranium is likewise attended with a similar effect, for the brain becomes too large in proportion to the rest of the body, and is very apt to inflame, and have effusions formed into it. At other times, the diseased state of the formative action appears most distinctly at the surface, the skin being rough, and very apt to desquamate.

that those who have either at the time of marriage, or before it, had scrophulous inflammation, are more likely to have their children strongly scrophulous, than others of the same family, who have not had inflammation. It is likewise certain, that if, by any cure, we can, for one or two generations, prevent the appearance of scrophulous inflammation, the children will become less and less diseased, or have less peculiarity of constitution; but if, by any accident, scrophulous inflammation be in one of the descendants excited, even in a slight degree, his immediate progeny will be more diseased than he himself before the induction of the inflammation.\*

With regard to the exciting causes of scrophulous inflammation, I may remark, that they are similar in kind to those capable of inducing simple inflammation; but they frequently operate more powerfully; that is to say, causes which would scarcely induce inflammation in a healthy person, may induce a local disease, and inflammation, in a scrophulous habit; because the different parts of the body perform their functions less healthily in a strongly scrophulous person, and are more easily deranged. In every system, those parts which are most delicate, or require the greatest perfection of action in order to keep them right, are most easily deranged. Now, in scrophulous people, the natural action being modified, the body becomes more delicate, and is more susceptible of derangement, especially those parts which naturally are delicate,† or require a perfection of action. The glands seem to be among the most delicate organs; for they have not only to perform the formative, or nutritive func-

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\* Some gentlemen have denied that scrophula was a hereditary disease; but it is unnecessary to offer any argument on this subject.

† This term is used here in a different sense from its common one, which signifies sensibility, or delicacy with regard to sensation, and capability of being acted on.

tion, in common with every other part, but they have also to perform a separate and distinct function, or change the nature of certain fluids which are brought to them. It is on account of the natural delicacy of the glandular system being increased by the diseased condition of the general system, and of the exposure of the lymphatic glands to the action of stimulating matter, taken up by the absorbents on the surface, as, for instance, matter from scabs on the head of children, that this species of inflammation most commonly appears in the lymphatic system ; but this system does not seem to be the peculiar seat of the diseased condition, as some suppose, nor to be otherwise predisposed to scrophulous inflammation, except in so far as its natural delicacy is increased by the diseased condition which it possessed, ab initio, in common with the rest of the body ; and consequently, it is rendered less able to perform its functions properly, the effect of which is, the induction of a new local diseased action, or slow inflammatory action, by the slightest cause.

Besides the common exciting causes of inflammation, the particular formation of organs may induce this disease, or at least make very slight causes produce it. Thus, for instance, in people with a very small narrow chest, the circulation of the blood must be performed with greater action than in other circumstances, and thus may tend to induce an inflammatory state. When the bones are very vascular, and imperfectly formed, they are apt to have a morbid degree of action excited in them by very slight causes ; and the same holds true with regard to any other part of the body which is imperfectly formed, or which is not exactly fitted for the support and performance of its requisite action.\*

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\* Parts which are improperly organized, or which are not in every respect similar, both in their structure and constitution (by which I mean, mode of acting in

Scrophulous inflammation is in general dangerous and tedious, in a degree proportioned to the effects and duration of simple inflammation upon the same parts. Thus, simple inflammation of one of the conglobate glands of the neck, is tedious, but not dangerous; and the same holds true of scrophulous inflammation; but the duration of this is much longer. Simple inflammation of the lungs, again, is dangerous; and scrophulous inflammation is infinitely more so. Such parts as heal easiest, when affected with simple inflammation, or ulceration, recover soonest from scrophulous inflammation; and the same causes which retard the one will retard the other also. Thus, the same cause which renders a superficial simple ulcer unhealthy and chronic, will prevent a superficial scrophulous ulcer from healing: But, if none of these causes operate, then scrophulous inflammation, or ulceration, will heal pretty readily, provided that simple inflammation, or ulceration of the same parts, would do so; but, for this purpose, it must be quickly induced; for all inflammation, or ulceration, which is slowly induced, is slowly removed. As a confirmation of these positions, we find, that a blister on a scrophulous person will heal readily, because the inflammation is induced acutely, or with a certain degree of quickness, and has, when the affection is simple, a promptitude to heal, which manifests itself also in scrophulous people. In this instance, the difference in the time required to heal the inflammation in a sound and a scrophulous person is not perceptible; because the affection, if simple, has a tendency to heal immediately. But, in a deep wound, espe-

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general,) to what naturally they ought to be, are not only less capable of performing their actions aright, but likewise are to be considered as in some respect extraneous to the human body, or, as it were, insulated, and do not correspond exactly to other parts. They therefore receive less support from the neighbouring parts, and, consequently, have their power diminished. The imperfection of action consequent to these causes is proportioned to the morbid condition of the part.

cially if contused, we find the difference more marked; because here, although the constitution be healthy, the duration of the disease is considerable; and, in a scrophulous person, the cure is protracted still longer, and the sore assumes a specific appearance. In diseases of the glands, the difference is still more perceptible; because the disease, although simple, is longer in duration. In affections of the bones and cartilages, the same is observed. When a bone is fractured in a healthy person, it unites without inflaming; and, in a scrophulous person, unless the diathesis be exceedingly strong, it likewise does so, but the union is longer of taking place; but, if a bone inflames in a sound person, the disease is very tedious; and, in a scrophulous habit, it is infinitely more so. The same holds true with regard to tendons and cartilages; and hence the greater danger of a sprain in a scrophulous than a healthy person. From these, and other facts, which it is altogether unnecessary to mention, it fully appears, that scrophulous inflammation is tedious and dangerous, in proportion to the progress and effects of simple inflammation and its consequences, when it attacks the same parts; but this proportion is not regular and uniform; but the duration increases, in a higher ratio, in proportion as the simple inflammation and ulceration of the same parts, and in the same circumstances, is tedious. Thus, a deep wound in a healthy person is pretty long of healing; but, in a scrophulous person, it is much more so. Simple inflammation of a gland is still more tedious than the same extent of inflammation in cellular substance; and scrophulous inflammation is still longer of running its progress; but the proportion betwixt the duration of the scrophulous inflammation, in these two cases, is not exactly as the duration of the simple inflammation of the two, compared with each other, but is in an increased ratio.

When scrophulous inflammation is excited in the vicinity of a part already possessing this action, it occasionally removes the action from that part, in the same way as inducing simple inflammation by a blister in one part cures the same disease in another part in the vicinity. It was an observation of this fact which made it be considered as part of the description of scrophulous tumours and ulcers, that they not unfrequently disappear in one place, whilst they show themselves in another; but, in every instance, this disappearance is an effect, and not a cause; for we uniformly observe, that, before it takes place, the new part has begun to inflame or swell.

With regard to the diagnosis of scrophula, it is impossible to say any thing satisfactory; because, as long as the inflammation remains trifling, and the skin sound, it is very difficult, if not impossible, to distinguish a scrophulous swelling from any other of a different kind. Much assistance has been supposed to be derived from the situation of the tumours, most of those which appear in the neck being considered as scrophulous; but this is certainly a false principle. From the same method of reasoning, most swellings in the groin have been considered as venereal, whilst many are of a very different nature, and not a few scrophulous. The best plan is to attend to the appearance of the body in general, and to the presence or absence of the sign of a scrophulous system; next, whether any ulceration be present, by the absorption of matter, from which these swellings may have been produced. If these be present in a system not possessing the marks of scrophula, the probability of the tumour being scrophulous is less; but, if the system be evidently scrophulous, then we must consider, whether the glands, originally swelled by the absorption of matter, have assumed the slow inflammation of a scrophulous nature, or have assumed a different species of inflammation, dependent upon the peculi-

arity of the matter ; for they can scarcely be supposed to be simply inflamed. Scrophulous swellings of the lymphatic glands are generally soft and doughy, and frequently give the feel of containing a fluid long before suppuration has taken place. They are at first free from pain, and, in mild cases, even toward the end, the pain is inconsiderable. When matter is formed, the skin generally becomes purple, and then gives way in a small spot. Swellings of the secreting glands are to be distinguished from schiro-cancer, by the hardness being less, the pain very inconsiderable, the presence of a scrophulous habit, and by the feel of fluctuation much earlier than takes place in cancer. Upon the whole, the presumption of any affection being scrophulous, is to be formed by the presence of the marks of a scrophulous diathesis, and the absence of such symptoms and appearances, whether antecedent or present, which characterise inflammation of a different species, or make us suppose it to have taken place, whether this be simple or specific. Scrophulous ulceration is distinguished by its peculiar aspect, joined with the marks of a scrophulous habit.

#### *Of the Treatment of the Scrophulous Inflammation.*

If the foregoing reasoning be just, it will appear, that, in scrophulous habits, our great attention ought to be directed to the prevention of the scrophulous inflammation, which is to be done by avoiding, as far as lies in our power, the operation of any agent tending to excite inflammation. It has been observed, that in scrophulous systems, very slight causes were sufficient to produce disease ; because the parts on which they act, possess a peculiar constitution, and are less capable of performing their natural and healthy functions properly, and therefore are sooner rendered diseased.

Inflammation may also be induced by the structure of the part being such as to prevent it from carrying on its functions properly, and therefore the same effect is produced as in the former case, where the constitution, or mode of action, and not the evident structure or mechanism of the part, was affected.

The lungs are to be prevented from assuming the scrophulous inflammation, by avoiding, in the first place, all the common exciting causes of pneumonia, such as cold, damp, &c. It is, in the next place, to be prevented, by avoiding such causes as tend to increase the circulation in the chest, or affect the function of respiration. Hence, violent exercise, climbing ascents, intoxication, thick hazy atmosphere, are to be guarded against.

The lymphatic glands are to be prevented from inflaming, by avoiding exposure to cold, and to the other common causes of inflammation, but especially by preventing the absorption of irritating matter, such as matter from sores, and the like. A neglect of this is perhaps one of the most frequent causes of scrophulous inflammation, for swellings of the glands of the neck can very often be distinctly traced to scald head, to ulcerations about the ears, little sores in the mouth, caries of the teeth, or to the absorption of particles of food allowed to remain and undergo fermentation in the mouth. The greatest attention ought therefore to be paid to cleanliness. The head ought in scrophulous children, to be washed daily, and the sweat removed from behind the ears; vermin ought to be diligently removed; but mercurial and acrid preparations, frequently used with that intention, ought to be avoided.

The mesenteric glands are to be prevented from inflaming, by supporting the action of the bowels, and preventing the formation of irritating matter, which, when absorbed, may swell these glands. Nourishing digestible diet, conjoined with rhubarb, and such remedies as act as tonics, at the same

time that they keep the belly easy, are of use in this view; for the whole process of digestion is thus supported, and neither the feculent part of the food, nor the mucus of the intestines, become morbidly irritating.

The other parts of the body are to be prevented from inflaming, by avoiding the usual causes of inflammation, and the action of whatever may injure the healthy condition of the part, or impede the natural action. Thus, the knee and ankle joint occasionally become affected with scrophulous inflammation after fatigue, which injures the healthy condition of the parts.

Besides these precautions, which are necessary in those of an evidently scrophulous constitution, with regard to particular parts, it is likewise useful to preserve as vigorous and perfect a performance of the natural actions of the system, considered in the aggregate, as possible, by which we lessen the risk of any one part becoming diseased; for, whatever impedes or diminishes the performance of the natural and healthy action of a part (and in this case, the whole body is to be considered as made up of parts,) renders that part more susceptible of disease, or derangement of its actions. Cleanliness, pure air, warm and sufficient clothing, nourishing and digestible diet, invigorating exercise, and a due proportion of sleep, are therefore very powerful preventives of this species of inflammation, insomuch, that Dionis remarks, that seventy-five out of the hundred, who came to be touched by the king, were children of the poor peasants.

When scrophulous inflammation does take place, then this invigorating plan is had recourse to as a cure, whilst, in truth it is most useful as a prophylactic. The invigorating plan, which consists in the use of good diet, moderate exercise, sea bathing, &c. is indeed useful at this period, both because it tends to make the disease more easily overcome, and prevents other parts from being injured; but its utility

is still greater as a prophylactic ; and it does not appear to have any certain efficacy in promoting the resolution of scrophulous tumours, because these have naturally a strong disposition to advance slowly to suppuration, and therefore are not readily affected by such means as tend simply to strengthen the system, or support its actions, because these do not change its peculiarity, or morbid modification, which existed, *ab. origine*. But, when the tumours have proceeded the length of ulceration, then they have gone a step farther to a natural termination ; and, although the means which strengthen the system cannot remove the scrophulous diathesis of the system, they may nevertheless accelerate the cure of a chronic tedious ulcer, which is slowly tending of itself to a termination.

The remedies called *agentes similes* operate more directly on the scrophulous mode of action than those means which tend simply to strengthen the system, and may be usefully conjoined with them, because these agents tend to induce an action different from the scrophulous one, at the same time that it possesses a certain coincidence with, or general resemblance to, the natural or healthy action. Hence, the bark has been frequently found to be useful in the cure of scrophulous inflammation, but oftener of ulceration than tumefaction of the glands, for the reason mentioned above. It does not appear, however, to possess, by any means, that certain power of curing scrophulous affections which is attributed to it by Dr. Fothergill, and several other authors ; nor are we to suppose that it shall infallibly cure scrophulous inflammation, or ulceration of parts, which, even when affected with simple inflammation, are very difficult to be cured. If we find it difficult to cure a simple inflammation, or ulceration of a tendon, cartilage, or bone, we must not be disappointed if even a specific remedy for scrophula (granting such a one ever to be discovered) were to prove

ineffectual in procuring a speedy restoration to health. The bark is likewise often ineffectual, because it is improperly administered. Given in small quantities, once or twice a-day, as is frequently done, it may prove a stomachic, and increase, like other tonic bitters, the power of the stomach, or the functions dependent on it ; but we never can thus obtain the benefits of the specific action of the bark on the system. For this purpose, it must be given liberally, in as great doses, and as frequently repeated as can be done without producing continued sickness, or vomiting ; and this must be continued regularly, late and early, not for days, but perhaps for weeks, at the same time that we prevent the action of such causes as would counteract the effects of the bark, such as poor diet, bad air, confinement,\* &c. Administered in this way, the bark may be rendered really useful, not only in the cure of scrophulous ulceration, but perhaps of many other diseases, whilst, in the common way of prescribing it, little or no benefit is derived from it.

The muriated barytes has been recommended by Dr. Crawford,† and has of late been tried in France by M. Pinel‡ and others. It does not appear to have any influence on tumid glands, or scrophulous tumours ; but occasionally it is serviceable in scrophulous ulceration. It is, however, a medicine on which very little dependence can be placed, and which fails in a great majority of instances.||

\* See what has been said on this subject when treating of the cure of mortification.

† See the second volume of Medical Communications.

‡ Nosographie Philosophique, vol. ii. p. 238.

|| When it is wished to prescribe it, the following is a very good formula .

R. Terræ Ponder. Salit. Chryst. gr. x.  
 Aq. Font.  
 Aq. Cassiæ utriusque uncias iii.  
 Syrupi Aurent. uncias ii.

Half an ounce of this may be given at first, twice or three times a-day, and gradually increased to such quantity as the stomach can bear without sickness.

The muriate of lime has been proposed by M. de Fourcroy; it is given more liberally than the muriated barytes, but it is not more efficacious.

Iron by itself, or mixed with the fixed or volatile alkalis, has also been frequently employed, but with very little benefit.\*

Burnt sponge, millipedes, vitriolated tartar, and many other trifling remedies, which were at one time in repute, are now deservedly neglected.

Cicuta has been greatly recommended by Dr. Fothergill and others.† It has very little effect on scrophulous tumours, or mild ulcers; but, when administered freely, it is sometimes of service in the irritable fiery ulcer, which was by the older writers called struma maligna.

Mercury is another remedy, which at one time was much employed in this disease; but few expect any benefit from it now. Gentle, or what has been called alterative courses, are, however, still recommended by many, with a view to satisfy the patient. Various preparations have been used. Some exhibited the corrosive sublimate, others the calomel, whilst the acetite of mercury, mixed with the powder of vipers and earth-worm, with the rust of iron, was much employed on the continent.‡ Antimony has frequently been conjoined with this, but without much benefit.

Nitrous acid has, I believe, in some cases, a considerable power over scrophulous ulcers. From the trials which I have made with it, I am inclined to attribute some effect to it in promoting the suppuration of scrophulous glands, or

\* This metal was one of the principal ingredients in a remedy used by the Maréchal de Rougeres, which consisted of filings of iron, sal ammoniac, salt of tartar, &c. *Journal de Med.* tom. xl. p. 219.

† This is highly recommended by M. Marteau. *Journ. de Med.* tom. iv. p. 121.

‡ *Pratique Moderne de Chirurgie*, par Ravaton, tom. ii. p. 33.

tumours, and in disposing ulcers to heal. Two or three drachms may be given daily, and continued for a fortnight, provided no bad effect be produced by it, such as pulmonic affections, &c. If, within this time, no melioration appear, we may give up this medicine.

The hepatised ammonia, in the dose of eight or ten drops, three times a-day, is sometimes useful in abating the pain, and changing the fiery appearance of the irritable ulcer, or struma maligna.

The breathing of oxygene has been proposed as a cure for this species of inflammation; but it will be extremely difficult for the advocates of pneumatic medicine to point out any authentic case in which it was really of benefit.

Much has been written concerning the local treatment of scrophulous tumours and ulcers; but we are still very much in the dark with respect to any efficacious method. Formerly, the extirpation of the gland, or tumour, was advised by all; but, more lately, doubts have been started concerning the propriety of the practice; and, by most practitioners, it is now deemed unnecessary, if not dangerous.

In the writings of the ancients, as well as many of the older writers on surgery in our own country, particularly in the works of Mr. Wiseman, this practice is freely inculcated; and many cases are detailed in which the tumour was extirpated with success. Even in the present day, no surgeon dreads the consequence of removing scrophulous joints, which, with regard to the present question, are to be considered in the same light with the glands.

It is supposed, that, by extirpating superficial tumours, the disease may be transferred to some of the more noble parts, and produce a more fatal complaint. But, if it be admitted that these tumours do not appear as necessary parts of scrophula, as the eruption of measles does of the rubellous fever, but only as accidental circumstances, or for-

tuitous inflammations, rendered tedious and specific by the peculiarity of the constitution, this supposition will appear to be groundless. Even granting that scrophulous tumours did appear without any local exciting cause, and were, in every respect, similar to the eruption of exanthematous fevers, it will not thence follow, that removing the local disease, after it has appeared, will make another part become diseased; unless it be said that scrophula depends upon a particular morbid humour, which, if denied an outlet in one place, must accumulate in another, which is a supposition I will not trouble myself to refute.

The arguments, then, against the excision, are not to be drawn from its danger, but from the pain which it produces, and from the number of glands which must frequently be removed, and which might perhaps be resolved without coming to suppuration. It is likewise at times dangerous to extirpate these tumours, on account of their situation.

On the other hand, when only one gland is affected, when it is superficial, and has continued so long, in spite of our remedies, that there is little probability of resolving it, then, by extirpation, we procure a speedy cure, and avoid a tedious disagreeable ulcer, and unseemly cicatrix. The existence of the scrophulous inflammation, and particularly the ulceration, has a tendency to increase the scrophulous diathesis, or peculiar mode of action of the system. By cutting this short, therefore, we prevent that evil, and render the system less susceptible of the scrophulous inflammation, and the chance of communicating the disease to the progeny less.

It may also be said, that the wound, after the extirpation, might not heal readily; but the testimony of many writers, as well as what I have observed myself, convince me that this is not the case; for the readiness with which the skin unites and heals, when not previously diseased, produces a speedy cure; whereas, had the diseased gland remained be-

low, and the specific inflammation been propagated to the skin, the ulceration must have been tedious.

Upon the whole, then, in determining on the propriety of extirpation, we must consider whether there be only one gland affected, or an incipient disease in a chain of glands; and, if only one, whether there be a probability of this one suppurating; and whether the advantage of an early removal of the affected part will not be counterbalanced by our losing the chance of restoring the part, and of preserving its functions and utility, as, for instance, in scrophulous inflammation of the breasts, testicle, joints, &c.

Caustics have been proposed with the same view as the incision; but they are more tedious, produce extensive ulceration, greater pain, and are much less certain than the operation.

Issues are recommended as a general remedy, to act as a drain to the constitution, and to render the drying up of the ulcer safe. In this point of view, they appear to be altogether useless and unnecessary; but, when employed as part of the local treatment, they are much more useful. The benefit arising from the use of issues, in the cure of scrophulous inflammation of the bones and joints, is now so fully established, by the practice of every surgeon, that it is useless to insist upon it here. In these cases, it is necessary to insert the issue, which is generally made with caustic, as directly over the affected part as possible; and the size of this issue ought in general to be correspondent to the extent of the disease. There are two circumstances which greatly tend to render this practice efficacious, and which ought to be fully attended to: First, that the disease be allowed to gain as little ground as possible before the insertion of the issue, or that the issue be inserted as early after the disease is observed as the patient will permit. Second, that, during the continuance of the issue, every circumstance be avoided

which may counteract its use, such as much use of the joint, or other species of irritation. In diseases of the lower extremities, therefore, whatever exercise produces pain must be carefully avoided; and, for the same reason, in diseases of the spine, proper contrivances to relieve the diseased bone from pressure are necessary to be conjoined with the issue. It sometimes happens, that matter has either formed before the insertion of the peas, or some time afterward. In this case, it either comes to be discharged by an opening through the ulcerated surface, or issue, or it bursts at a more dependent part. In the first situation, no change of treatment is necessary; in the second, it is of service to insert a pea over the mouth of the aperture, which has a tendency to heal the part below, and prevent the formation of a tedious sinus. When the part becomes free from pain, and the soft parts have subsided in their swelling, and matter does not appear to be forming, or does not continue to be formed, if it had already been secreted, we may consider that the effect of the issue is now produced, and may begin gradually to diminish its size.

Issues, employed as a local remedy, have hitherto been chiefly used in diseases of the bones and joints, and sometimes in scrophulous affections of the liver, or lungs; but it is reasonable to suppose that they ought likewise to be useful in the cure of enlargements of the glands, and other scrophulous tumours, if inserted in the immediate vicinity of the part. The only objection to their use is the cicatrix which they leave, and which, in certain situations, we would wish to avoid. When the tumour is thickly covered with the integuments, the issue may be made directly over it, by means of a blister, kept open by savine ointment,\* or any other ir-

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\* This ointment may be prepared by macerating one part of recent savine leaves bruised, in four parts of ung. resinos. ; it is then to be strained.

ritating preparation ; but, when the tumour is thinly covered, this will not succeed, as the inflammation consequent to the insertion of the issue will be communicated to the gland which is in immediate contact with the ulcerated surface. In this case, a small pea issue, or seton, may be inserted by the side of the tumour. In scrophulous inflammation of the glands of the neck, this remedy is not advisable, owing to the scar which it leaves ; but in affections of the mammæ, and some other parts, it may be useful.

Blisters, frequently repeated, are sometimes in slighter cases of affections of the joints, used in place of issues.

Preparations of lead are frequently employed, and, where the tumour is painful, are often of service. When the lymphatic glands are inflamed, a saturnine solution,\* applied cold to the part, by means of a compress of linen, and frequently renewed, has a tendency to abate the pain, and resolve the inflammation. These solutions are sometimes employed warm, particularly in affections of the bones or joints ; but they do not, in these cases, seem to have any considerable superiority over fomentations with warm water.

Cloths dipped in cold water, sea-water, or weak vegetable acids, have also been used, and have a tendency to abate pain, but are inferior to the saturnine solution.

Ether, applied with a pencil to the part, is also sometimes of service.

Sea salt, mixed with bile, has been recommended, but has very little effect.

Camphorated liniment is very frequently used, in which case the part is generally kept warm with flannel. It does not, however, appear to possess any very great power of dis-

\* The following may be used for this purpose:

R. Ceruff. Acetat drachmam unam.

Aq. Rosar. uncias octo. Solve, dein cpla.

cussing these tumours ; but the friction which is made use of with these sometimes hastens the removal of these tumours, and may be usefully alternated with the use of the saturnine lotion. A mixture of ether and linimentum opiatum may be employed for the same purpose.

Hemlock poultices were at one time in repute, but they have now lost their character.

By these means, even after a small quantity of matter is formed in the gland or tumour, we may discuss the tumour, or make it less ; but, if the quantity of matter should continue to augment, we may consider resolution as out of the question. Our object must then be to bring the part to suppuration as quickly as possible ; because we not only thus shorten a process which must be completed before the parts can be healed, but also render the ulcerative action more healthy, and easier induced ; for the more quickly that the suppurative action is performed, the sooner does the ulcerative action take place, and the more vigorous is it, provided that no new cause render it unhealthy, as has formerly been mentioned.

This advice, however, must not be adopted without some exceptions, and must be chiefly confined to affections of the glands and cellular substance, and ought not to be extended to the joints. In these cases, even although a small quantity of matter form, we ought still to endeavour to prevent general suppuration, and the bursting of an abscess ; because this would, instead of accelerating the cure, as is frequently the effect in the other case, be attended with dangerous consequences ; we must therefore rather continue the use of the issues, and endeavour to procure the absorption of what matter is already formed.

The means employed for promoting suppuration were formerly poultices of lily roots, honey, &c. alternated with fomentations prepared from pomegranate seeds, and myrrh,

and cypress leaves, or, occasionally, stimulating plasters; but now the common bread and milk poultice is advantageously substituted in place of these remedies. When the process is very tedious, electricity is useful along with the poultices.

When these tumours have suppurated freely, and an abscess occupies the whole of the gland, it is useful to evacuate the matter by a small opening with a lancet, if there be no appearance of the abscess bursting quickly, and the sooner this is done the better. When this is done, a poultice should be applied until next day, the part is then to be wiped clean and dry, and a small bit of lint, spread with simple ointment, applied on the orifice. The surrounding red skin is to be dusted with powdered cerussa,\* and then covered with dry lint. A compress is to be laid over the whole, and moderate pressure employed. These applications are to be renewed every day, or twice a-day, according to the quantity of the discharge, and other circumstances; and, at each dressing, the parts may be bathed with spirit of wine. If this mode of dressing does not produce a cure, but the opening enlarges, and the surface ulcerates, we must then employ the dressings for a scrophulous sore.

When, notwithstanding the use of issues, matter is formed in joints, or, when these fail to procure the absorption of what was formed before they were introduced, then one of two things must happen; either the abscess must be punctured, or it must be allowed to burst of its own accord. In general, I believe, it is most advantageous to allow the abscess to burst without any interference, except the continuance of the issue, or the establishment of such new ones as circum-

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\* Keeping this skin dry has a tendency to prevent ulceration, and abate the redness and inflammation. The cerussa may sometimes be advantageously mixed with an eighth part of powdered camphor, which promotes the removal of the superficial inflammation.

stances, particularly the situation of the pain, may point out. If, however, it were at any time deemed proper to evacuate the matter, this ought to be done with a small trocar, at different times, in the manner recommended by Mr. Abernethy for the cure of lumbar abscess. This is infinitely preferable to the barbarous practice which even some surgeons high in reputation advise and make use of, I mean the insertion of a seton through the abscess of the joint.\*

When the scrophulous suppuration ends in the ulcerative action, the cure is generally tedious. It is even doubted by some how far it is safe to attempt a speedy termination to the ulcer, as it is supposed, that, in this case, the disease may be driven to some other part: And so fearful are they of this dreadful event, that they are careful, by issues and new artificial sores, to continue the discharge after the original ulcer is healed.

If I have been right in my view of this disease, it will appear, that this reasoning is false, and that the practice is both useless and troublesome. Even those who propose and defend the practice, do so, not upon the principles of reason and judgment, or from logical deductions from the theory which they give of the disease, but upon imaginary apprehensions. We find, for instance, Mr. Bell saying, that, "till the disease is eradicated from the habit, all that should in general be done to the sores, is, to give as free and open vent to the matter as possible."† From this, we should, without doubt, expect, that he considered scrophula as dependent upon some peculiar humour which was to be expelled; but just before we are told, that this disease depends upon debility, particularly of the lymphatic system; a condition which it is not customary to talk of eradicating, or

\* Bell on Ulcers, p. 471.

† Bell on Ulcers, p. 427.

rooting out, or expelling. Upon the common principles of reasoning, Mr. Beil ought only to have forbid healing the sores, until the system was strengthened, otherwise the weakness would be driven or determined to some other part.

Moderate pressure, by means of adhesive plaster, conjoined with the application of cold water, is one of the best remedies for the mild scrophulous ulcer, when it is situated so that this can be used. When it is not, then dusting the part thickly with cerussa, containing a sixth part of powdered alum, may be had recourse to. A piece of dry lint is next to be applied, and a compress bound down with such pressure as can be used. It is sometimes useful to dip the compress in cold water, and renew it frequently.

The ceratum e lapide calaminari forms a very good dressing for this sore, when it is intended to leave it to follow its own course.

As a stimulant, the unguentum resinorum, either alone, or mixed with red precipitate, is often used; but it seldom is of service, and often makes the sore irritable. If, however, the ulcer become very indolent, this, or the citrine ointment, properly diluted,\* may be of service. The same may be said of the other common stimulating applications.

Poultices, made of bread and sea water, have been recommended, but seem to possess little power of accelerating the cure.

Solutions of alum, of blue vitriol, corrosive sublimate,† of the nitrites of copper, bismuth, and silver, are sometimes useful to wash the sore with.

\* This application forms a very useful remedy for the scrophulous ulceration of the eye-lids, which we so frequently meet with.

† This substance is the basis of a celebrated lotion for the face, which is sometimes useful in chronic pustules, which are frequently of a scrophulous nature. It promotes suppuration, the pustule then scabs, and, when this falls off, the part is sometimes found sound below. It is made by dissolving corrosive sublimate in an emulsion of bitter almonds.

The recent leaves of the wood sorrel bruised, and applied raw to the sore, is sometimes useful. The same may be said of cloths dipped in lemon juice, or vinegar and water.

Saturnine ointment is much employed by some, for abating heat and pain; but is inferior to compresses dipped in cold water.

Sometimes only the anterior part of a scrophulous tumour suppurates and ulcerates, and the deeper part of it remains swelled and hard. In this case, the bottom is generally covered with a slough, which comes slowly away piecemeal, and is renewed for some time, until the tumour subsides, partly by sloughing, partly by absorption, and partly by the subsidence of the remaining inflammatory action. In this case, sprinkling the surface lightly with precipitate, or blue vitriol, is of service; and this may be alternated with the common warm poultice. When the surface becomes cleaner, dry lint forms a very good dressing; and this may be covered with a pledget of linen spread with cerate. Afterwards pressure is useful.

The irritable overacting sore, or what has been called the struma maligna, is very difficult to manage, especially as it is frequently connected with a diseased state of the bones or tendons below.

The hepatized ammonia, diluted in the manner formerly mentioned, or simple ointment, mixed with opium, are sometimes of use.

Poultices of bitter almonds, beat up with a little olive oil into a fine pulp, and then warmed, occasionally relieve the pain, and make the ulcer more healthy.

Carrot poultices, or warm poultices made of bread and strong decoction of camomile flowers, are also sometimes of use.

Carbonic acid gas, or carbonated hydrogen, are sometimes of temporary, rarely of permanent advantage.

Anodynes, internally, are useful here, as in other painful sores.

In all cases of scrophulous inflammation or ulceration, it is useful to exhibit, along with the proper local treatment, such internal medicines, and to attend to the constitution, in such respects as may be deemed proper. Upon these points I have already made some observations.

When the local disease cannot be cured, and has induced the scrophulous hectic; when this cannot be removed by the means commonly employed, and which have been mentioned in the dissertation on simple inflammation, then the diseased part must be removed, if its situation permit. This must not, however, be rashly done, but must be delayed until we ascertain that our remedies, general and local, (which must be used with assiduity and care) are of no avail. It is not sufficient that the hectic continues, and that other appearances are almost stationary; they ought to be augmenting, in order to justify amputation of a useful and important part; because every practitioner must have observed the recoveries which take place, even after the hectic fever has made considerable progress. On the other hand, we must not allow the constitution to suffer too much, but must interfere, whenever we perceive that our labours are fruitless, and that the hectic is regularly and progressively increasing, and the strength sinking. When this is observed, the only chance for life is an operation; and every day this is delayed adds to the risk attending it; for there is a degree of injury, more than which the constitution cannot sustain, and which will prove fatal, even although the exciting cause be removed. To fix the proper period requires judgment in the surgeon; but he may be enabled to do so, by attending carefully to the state of all the symptoms; for whenever these continue progressively to become worse, and have reduced the patient already to a state of weakness, which can-

not be much increased without danger, he may consider it as impossible to delay amputation longer with any hopes of success.

Having made these observations on this species of scrophula, I shall now conclude, by shortly mentioning the mode of treatment adopted by the older practitioners.

Bleeding, which at first was made use of according to the custom of the day, was soon laid aside, on observing, that, in many cases, it was manifestly hurtful, and in every instance useless. But although the plan of general depletion was given up, yet local evacuations were much insisted on; for they held it as absolutely requisite, that the brain should be purged of its pituita, (the redundancy of which produced the disease) by errhines, fomentations to the ears, and the application of issues and sinapisms to the head. The stomach was cleared of viscosities, by emetics of mustard or broom-seed; the bowels, by aloes; and the skin and kidneys, by sudorifics and diaphoretics.

Having thus procured a sufficient evacuation, the patient was desired to smell a pomum odoratum, composed of styrax, amber, myrrh, aloes, and many other ingredients; the vapours of which were supposed to get up to the anterior ventricles of the brain, and dry them. Hunger and thirst, by drying the juices, were decreed to be salutary. Every thing was rendered nauseous with medicine. The bread was seasoned with anise and fœnugreek seeds, and the drink consisted of decoctions of guaiac and mastic wood, which last was "a friend to the brain and viscera."\* As a condiment to these medicated meals, Arnoldus de Villa Nova treated his patients to the burnt sponge, mixed with salt and pepper.

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\* Laurent. de Strum. Nat. p. 67.

But these, and indeed all the medicines yielded by the *materia medica*, were considered as trifling, and of no avail, when compared to the miraculous power possessed by the king, who, with one touch of his hand, could banish this dreadful disorder, and dry up all the sores. So valuable did this royal prerogative appear in the eyes of many, that it became a national controversy, whether it belonged to the French or English; whilst the Romish and Protestant churches reciprocally urged this prerogative of the king of the country where they were established, as a manifestation from heaven of the justice of their cause.

In France, the king touched publicly, at four stated feasts in the year, preparing himself the day before by prayer and fasting; then entering the apartment where the sick were arranged, the patients were individually presented by the chief physician to his majesty, who placed his hand upon their head, pronouncing these words, "*Le Roy te touch, et Dieu te guarit.*" The sick then retire, and soon find a manifest amendment. "In some the ulcers dry up; in others the swellings diminish; and, wonderful to relate, in a few days, more than 500 out of 1000 are perfectly cured!" "*Hic hœrant philosophi, cœcutiunt medici, stupet prophannum vulgus.*"

Upon reading these accounts, we smile at the credulity of mankind; but we pity them, when we learn, that near a thousand every year made weary and expensive pilgrimages, from very distant countries, to purchase this imaginary benefit.

## DISSERTATION VI.

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### ON THE CANCEROUS INFLAMMATION.

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THE cancerous inflammation generally comes in slowly, in some glandular part, which becomes rather harder, and somewhat larger,\* than it ought to be ; but the pain, for the most part, at first is trifling. By degrees, both the hardness and swelling increase, and a pain, like the pricking of needles, is felt in the part. This pain, after some time, becomes more violent, darting through the whole of the gland, and leaving a sensation, as if the part had been rudely wrung or twisted. The tumour still remains moveable under the skin, which is of the natural colour ; but when the disease has continued a little longer, a greater degree of inflammation takes place, and adhesions are formed betwixt the skin and the gland, or the gland and the parts below, at the same time that the pain becomes more continued. The skin now becomes puckered, or drawn inward, and of a dirty or leaden hue, which in time acquires more of the red, but is never of a bright colour. The veins are varicose, and the tumour is, with difficulty, moveable. When the skin becomes red, we may be able to discern a superficial fluctuation, which proceeds from part of the gland forming an abscess.† This at

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\* Although the affected gland becomes rather larger, yet the surrounding cellular substance sometimes diminishes, and the neighbouring glands are rather contracted, in which case the part seems to be shrunk.

† This abscess sometimes, though very rarely, occupies the whole of the gland, but oftener only a part of it ; and if the gland be large, there are sometimes

last bursts, and discharges a thin yellowish matter, which frequently oozes out in very considerable quantity; the orifice enlarges, and the sore penetrates, for a little way downward, pretty rapidly, and the edges become hard, and overlap a small part of the disk of the sore; but, soon after this, a fungus rises up; and although, in some places, the ulcer may become deeper, yet its chief progress is laterally.

The cancerous ulcer increases more or less rapidly, and is soon attended with a burning pain; the surface is unequal, excavations appearing in some parts, whilst in others a fungus rises up. The colour is brown, but glistening or fiery. The granulations very soft and indistinct. A thin ichor, of an abominable foetor, is discharged in great plenty, mixed with blood; whilst, in many parts, small pellicles, like lymphatic exudations, cover the sore. The surrounding skin is of a dark purple colour, and the adjacent parts very hard. The margins, which at first were overlapping the sore, in the course of a few days are uniformly elevated, and frequently retorted and unequal, as if they had been bitten by an animal; and over these the fungus frequently shoots or protrudes, so that the sore assumes the appearance of a cauliflower. This ulcer bleeds a little upon the slightest touch, so that at every dressing the cloths are generally bloody; but, at times, this bleeding is more alarming, proceeding from the bursting of the diseased veins. These hemorrhages are, in some instances, very frequent, and reduce the patient to the greatest weakness. Sometimes they suddenly relieve the unhappy persons from all their wo.

Some time after the abscess forms, and frequently before ulceration takes place, the neighbouring lymphatic glands

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several abscesses, of considerable size, which form unconnectedly with each other, and burst separately.

swell, and become affected with a similar action, and follow the same course with the original sore ; only in them the progress is generally more rapid.

After ulceration takes place, sometimes before it, if the abscess be considerable, hectic fever takes place ; the countenance becomes sallow and unhealthy ; the pulse quickens, and becomes small and sharp ; the strength fails ; night sweats come on, and colliquative diarrhœa hastens death.

The parts in which cancer most frequently appears, are the under lip, the breasts of women, and the testicles of men : But there is no one part of the body in which it may not occur, although most frequently it is, in its original attacks, confined to secreting glands.

In the breasts, parotid glands, and some other conglomerate glands, the disease begins as has been described ; but on the skin, and in some other parts, the progress is somewhat different. The skin, particularly that of the face, is apt to have a small chronic pustule formed on it, by the inflammation of one of the sebaceous glands, which, by degrees, becomes harder, firmer, and more elevated. Soon afterwards, it becomes rough, and of a warty appearance : It then ulcerates on the surface. This is covered with a scale or scab, which repeatedly falls off, and forms again upon the part, until it assume the appearance and character of the cancerous sore. But, more frequently, the disease is not allowed to follow this progress, the wart either being rubbed off accidentally, or removed by ignorant persons. The part then forms a superficial ulcer, which is slightly hollowed. It is of a glistening flabby appearance, and the margins are hard, tumid, and a little turned back : But after the disease has continued some time, the flabby appearance of the sore is converted into fungus. We may, therefore, from this, and other cases, conclude, that cancerous ulcers, which

are formed without previous abscess, form fungus more slowly than those which are formed with them.

When the lips become cancerous, there is generally first perceived an indurated lump, of greater or less bulk. The skin over it becomes tender, frets, and is covered with a scurf or scab, which gradually becomes elevated. Part falls occasionally off, but it is soon replaced. This by degrees extends itself over the prolabium, and, after some time, falls off entirely, leaving the part with all the common characters of the cancerous ulcer. The pain is burning.

When the testicle becomes cancerous, it sometimes follows the common course of cancer in other glands, beginning with hardness and shooting pain in some part of the testicles or epididymis, which gradually forms an abscess, and ulcerates. But, at other times, soon after the testicle becomes diseased, an effusion takes place within the tunica vaginalis. In this case, the disease of the testicle becomes complicated with hydrocele. It is distinguished by our feeling the hardness of the epididymis behind, or the hardness and inequality of the testicle, when the water is drawn off. It likewise, after some continuance, becomes more painful than a common case of hydrocele. If the testicle be not extirpated in due time, the cord becomes hard and swelled, and comes to ulcerate.

Cancer in the penis generally begins by a kind of warty tumour, and follows the course of cancer in the face. Sometimes the penis becomes just like a cauliflower, a large fungus extending from its ulcerated extremity.

The uterus, in elderly women, is very frequently affected with cancer.\* It begins with a feeling of weight and unea-

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\* It has been said, that genuine cancer is very rare in the uterus, and that the cases which pass for such are phagedenic. But although the uterus may be affected with scrophulous inflammation, and phagedenic, as well as some other specific affections, yet it must be admitted, from an examination of cases, that the uterus

ness in the lower part of the belly, and the natural discharge of the parts is increased, so that the disease passes for fluor albus. By examination, however, we may generally discover a hardness, and sometimes an inequality, about the os uteri, and may discover the uterus to be unequally enlarged. After some time, ulceration takes place, and matter, mixed with a bloody fluid, is discharged. Occasionally, considerable hemorrhages take place, which are not unfrequently confounded with menorrhagia; but it may be distinguished by the continued discharge of a bloody sanies during the intervals of the hemorrhage; by the continual pain, and especially by our feeling the projection of the os uteri into the vagina, in some places hard, and in others soft, but rough, which shows ulceration. After some time, the glands about the vagina swell; and that canal, in many places, becomes considerably straitened. Hectic terminates the sufferings of the patient. On opening the body, we find the uterus generally, though not always, considerably enlarged, with abscess and ulcers in different parts of its substance. These ulcers, as well as those of the ovarium, and, so far as I know, every gland in the internal cavities of the body, have a less tendency to fungate, than cancerous ulcer on the surface of the body.

When inflammation attacks any organ, or part of the body, and leaves a chronic tumour, this may assume, as will afterwards be mentioned, a new inflammation, and may become affected with cancer; though it more frequently happens, that it assumes the pseudo-cancerous action. The symptoms and progress of cancer are much the same here as in the breast.

When the eye becomes cancerous, it, unless the disease begins in one of the glands, such as the lachrymal, or those

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is very frequently attacked with true cancer. Its substance is found enlarged, hard, and containing cancerous abscesses in different parts.

of Meibomius, is first of all affected with simple inflammation, which destroys the whole texture of the eye, and makes it of a different structure, rather resembling a confused mass than a well organized body. The lucid cornea becomes opaque, and protrudes; the eye enlarges, is affected with a violent deep-seated pain, and at last bursts, generally on the apex: From this a fungous substance protrudes, which manifests all the symptoms of the cancerous ulcer, and in a short time arrives at a great size.

When the nose becomes cancerous, the disease either begins on the outside, with a small tumour or wart, as in other parts of the face, or within, by a firm and somewhat painful polypous projection, which frets on the surface, and soon assumes the cancerous ulceration.

The diagnosis of this disease is of the utmost importance; because if we mistake cancer for some other disease, we not only neglect the proper practice, but frequently are led to prescribe remedies which do infinite harm. If, on the contrary, we mistake another disease for cancer, we neglect the necessary means of cure, and may even be led to extirpate a part which might be easily cured by gentler treatment.

Cancer may be confounded with scrophula, syphilis, and some other affections, which have received no particular name.

There is an affection\* which begins like cancer, by a hard schirrus, either of a gland, or still more frequently of one of the chronic tumours, which has been already mentioned as succeeding slow inflammation. This remains, for a considerable time, hard, and free from pain, and there is no puckering of the skin over it. By degrees, some part of the surface becomes of a purple or livid colour, and ulcerates.

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\* To this specific affection, we may give the name of pseudo-cancer, for want of a better designation.

This ulcer remains long superficial; the edges are hard and rounded; the discharge is thin; the surface is glossy, and no distinct granulations can be seen; the pain is slightly smarting, but not burning, and, instead of being fungous, the sore is slightly hollowed out below the level of the surrounding skin. By the continuance of this affection, the gland is apt to shrink and diminish in size; and generally where this takes place, the sore contracts and heals with a very puckered unequal cicatrix, having, in some places, a thick dark coloured scab covering it.\* The neighbouring glands become affected; but they are soft, and rather resemble the spongy inflammation than schirrous hardness: But I have never had an opportunity of observing them proceed the length of ulceration. If the continuance of the sore be long, the constitution is affected, and the patient becomes hectic.† This kind of ulcer may be distinguished from cancer, if we attend to the absence of the fungous, and peculiar appearance of the cancerous sore, and the want of the burning pain: But, before ulceration takes place, the two diseases may be confounded; because there are no certain characteristics of schirro-cancer.

This disease may attack the uterus, and is very apt to be confounded with cancer; nor is it easy to distinguish them, as the parts are unseen. There is never much enlargement. The ulcer is pretty smooth, and the margins circular, hard, and glabrous. The pain is not very considerable. The dis-

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\* Of this nature was probably the ulcer mentioned by Mr. Wiseman, at least if we may judge from his very short description: "It had eat deep into her left breast, and was fixed to the ribs, but not with much pain. In progress of time, the lips inverted, and united, as it were, and lay covered with a crusty scab; the humour in the mean while spent itself upon the nerves, &c. She lived long, and, in her latter age, tolerably healthful." *Chirurg. Treatises*, vol. i. p. 165.

† Extirpation is the only certain cure of this disease; and it is at all times the quickest and the best; but, by eschorotics, we may sometimes procure cicatrization, at least if the gland have shrunk, and most of its substance been destroyed.

charge is thin, copious, and of a yellowish colour, but seldom bloody, unless when the disease has continued very long.

The spongoid inflammation has been considered as cancerous by those who have seen it ; but the distinction betwixt the two is sufficiently obvious : The one begins with a spongy elastic tumour, the other with a firm hard lump.

Scrophula may be mistaken for cancer, when it appears in one of the secretory glands, such as the breasts ; at least as long as it remains without ulceration. But the tumour generally enlarges more rapidly than cancerous tumours, at least such as are not very painful. It is pretty soft and doughy, the pain is inconsiderable, and we may generally perceive the marks of a scrophulous habit. When ulceration takes place, the opening is, for some time, sinous, and the matter discharged is curdy, and without fœtor. When the ulceration extends along the skin, it has not the fungous appearance of cancer, but the aspect of a scrophulous sore, and the gland below appears slongly. The pain is not very considerable, and is not of the burning kind.

Scrophulous inflammation may also attack the uterus, bladder, and any of the internal organs. The uterus and bladder become thickened, and contain abscesses in different parts, which point on the surface of these viscera. They are filled with a thick white cheesy-looking matter ; and when they burst, they produce ulcers, with a foul surface, and having the margins notched, and lying for a considerable way over the disk of the sore.

The distinction betwixt cancer and the venereal ulcer is so very striking, that it is scarcely possible for these diseases to be mistaken for each other, if the discriminating marks of each be attended to. The cancerous sore is always dark coloured ; the surface fiery, yet of a fungous nature ; the discharge foul, and of an intolerable smell ; and the bottom and surrounding parts are hard and painful. If

there be not an open running sore, the part is covered with a dry elevated scab, of a dark colour; the skin around this is livid, and the neighbouring parts indurated. The base of the venereal sore is much softer, the discharge is of a different nature, and its aspect so peculiarly unlike the cancerous sore, that it is impossible to confound them.\*

There is another disease, which is very apt to be confounded with cancer, and which, at one period, resembles it very much. It begins with a small tumour, like a phlegmon, of a dull colour, and without much pain. This soon assumes a soft elastic feel, and bursts at the top; a bloody matter oozes out, the lips of the orifice become tumid, and the integuments ulcerate. The whole has a convex surface, the ulcerated part being most prominent; and the sloping margins are red and painful: The ulcer itself is foul, of a dark fungous appearance, and covered with thick offensive matter, with sloughs in different parts; the margins are hard, and lie, in a serrated manner, over part of the sore: The pain is smarting. This sometimes spreads to a considerable extent, and cuts off the patient. At other times, by the use of mild dressings, good diet, and opium internally, the fungous surface sloughs off by degrees, and shows a smooth red bottom, somewhat striated, and of a glossy appearance, which contracts, and scabs over, like the pseudo-

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\* It is to be regretted, that some who belong to our profession, reason upon the nature of ulcers, not from appearances and characteristic marks, but from the patient's manner of life, or the idea which they have formed of the country whence they come. I remember two instances of people who came from the Hebrides, the one with a cancer of the lip, the other with a cancerous ulcer on the neck, both fungous, and possessing the burning pain, and every character of cancer; but as the sabbens unluckily prevailed in that country, it was thought that the patients might have received this infection, and accordingly were, by a full consultation of surgeons, condemned to undergo a course of mercury. The lip was, in three days, greatly worse; the mercury was omitted, and the patient cured by an operation. The sore on the neck was instantly exasperated, and the patient, to use the words of Hildanus, "had her soul speedily sent to heaven."

cancer. The fungous, in this ulcer, never rises high ; it is generally slightly convex, being most prominent at the centre, and has never the retorted trumpet-like appearance of some cancers.

Phagedena has sometimes, particularly on the yard, been confounded with the cancerous sore. It has indeed the brown fiery colour, and smarting pain, possessed by the cancerous ulcer ; but it wants the fungous appearance, which the cancer very soon assumes. It spreads with greater rapidity, and is not surrounded by the same hardness. It begins likewise more suddenly, and without any previous hard tumour. We frequently hear of venereal buboes becoming cancerous ; but this seldom, if ever, happens ; and phagedena has, in this case, been confounded with cancer ; for that spreading fiery honey-comb-like ulcer, which venereal buboes sometimes turn into, is evidently of the phagedenic nature.

It was from allowing too great latitude to the description or definition of cancer, as well as from the numerous divisions admitted by the older writers, such as mild, raging, and the like, that many diseases have come to be considered as cancerous, which are in their nature perhaps radically different from it.

The mild cancer was said to begin slowly, with little pain, to continue long indolent, and to ulcerate slowly : The ulcer was not very painful, and frequently healed with a scab, or remained long stationary. This evidently was not a cancerous disease, but the one which I have described above. On cutting into this tumour, after extirpation, we find it to be of a firm texture, the interstices filled with a kind of oily matter, and no cavities with thickened sides in its substance.

The malignant, or true cancer, begins with a hard schirrous tumour, with frequent lancinating pain ; the skin soon

adheres to the gland, and becomes slightly puckered, and of a livid or leaden colour; the veins are more or less varicose, although the tumour be not large; and the nipple, when the disease is in the breast, is generally drawn inward. The integuments next become red, and a small opening forms, through which is discharged a bloody serous-looking matter, generally in very considerable quantities. The ulcer which succeeds this is, at first, superficial, affecting only that part of the integuments which covered the pointing of the glandular cyst or abscess. It is dark coloured and fiery, like phagedena; but the edges are hard and ragged, and overlap irregularly, in different spots, small parts of the surface of the sore. In the course, however, of a few days, sometimes in a few hours, a fungus protrudes, and increases more or less rapidly, at the same time that the sore spreads laterally. This fungus is very irregular, of a dark colour, and covered with sloughy-looking pellicles. It generally sprouts out most toward the circumference, so that the sore has often the appearance of the mouth of a trumpet; or if the cavity in the middle be less, the fungus being less turned out, it resembles a cauliflower. This fungus uniformly projects over the margins, which are hard and red. The matter discharged is thin, bloody, and exceedingly foetid. On examining these glands, we find them, in the commencement, to be hard, like a substance intermediate betwixt gland and cartilage, and of an indistinct granulated structure. Soon afterwards, we perceive small abscesses or cavities in different parts, which are filled with a serous fluid, and the sides of which are hard and firm, like gristle. These enlarge gradually, and new ones form; so that were we to cut the gland, we should find it containing a great number of these cavities.\* Those

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\* These are sometimes very irregular in their shape, and have their sides very thin; so that, at first sight, they appear like cavities formed by the separation of the fibres of the part.

which are nearest the surface of the gland, generally enlarge most; and sometimes only one gains any considerable size. Before this bursts, its sides become more opaque, and more blended with the rest of the gland, (which, where it surrounds the abscess, becomes softer, rather more vascular, and more porous or spongy than in other parts, and than it formerly was,) unless it distend beyond the substance of the gland, pushing the skin outward. In this case, when it bursts, a great quantity of lymphatic matter is discharged, and the part collapses, and then exhibits the usual appearances of the cancerous ulceration: But, more frequently, we find the abscess remain altogether in the gland, and only distend the skin a little at the apex, where it points. When the abscess bursts, more or less fluid is discharged, and immediately the inner surface begins, like the orifice, to ulcerate. A fungus is produced from the sides of the abscess, which fills up the cavity, and then protrudes from the orifice. We, therefore, find, that when the cancerous abscess bursts, the orifice at first assumes the appearance of a cancer which begins in the cutis;\* but very soon a fungus protrudes, and the ulcer gradually becomes more convex, or more like a cauliflower.

These abscesses, with thick sides, are characteristic of cancer, and are never found wanting in a cancerous gland. When they are not present, we may be certain, that the tumour is a different kind of schirrus. But although these be always found in the glands, and form in them a certain mark of cancer, yet they are not necessary to the existence of that disease; for the cancerous ulcer, like common ulcers, may

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\* That is to say, the sore is rather flabby than fungous; for cancerous ulcers which begin superficially, and without previous abscess, remain a considerable time without forming fungus; but when an abscess bursts, and the skin ulcerates in consequence, then the sore is not superficial, but communicates with the abscess, which forms fungus quickly

begin without previous abscess, as we observe in the cancer of the skin, which, in nine cases out of ten, begins with excrescences like warts.

By attending to these circumstances, we may generally form a pretty just diagnosis. At the same time, it must be admitted, that, occasionally, cases do occur, in which it is impossible to deliver a decided opinion: Nor is it doubtful, that many ulcers are considered as cancerous, which are of a different nature, and some of which admit of a cure. In forming our judgment, we must be directed by the nature of the first symptoms, and the history of the schirrous stage; by the appearance and aspect of the fungus, and the other circumstances which have been already described.

Concerning the peculiar state of the parts in cancer, or the proximate cause, many opinions have prevailed; but these, however they might differ in certain points, have almost unanimously agreed in admitting obstruction as the chief cause of this disease.

Until lately, the melancholic humour was supposed to be the fluid which was obstructed, and accumulated, in consequence of which it fermented, and produced a burning ulcer; and whatever promoted the generation of this humour, was currently admitted as a remote cause of cancer. Women, says Ambrose Paré, are more subject to schirrus than men; "because their liver is warmer, and their spleen being weaker, is less able to purge the blood of choler." Grief and chagrin, by promoting the formation of this fiery fluid, were accordingly considered by the celebrated Heister, as very apt to induce the "cancerous diathesis;" and he slyly adds, by way of corollary, that "old maids, and women who do not breed, are very subject to cancer in the breast."\*

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\* Heister's Institut. Vol. I. p. 229

Concerning the particular changes which took place in the nature of this obstructed humour, many different opinions prevailed. Some thought it necessary, that the black bile should be charged with an acid, and that this produced ulceration, when "its sharp cutting points had surmounted and destroyed the volatile smegmatic and balsamic salts of the blood." Others conjectured, that by an "adustion or over-concoction," it grew sharp and burning: But Wiseman observes, that it is more probable that it becomes somewhat arsenical. It would, however, be useless to enumerate the different changes which this imaginary humour was supposed to undergo. It is sufficient to observe, that these were almost universally believed to depend upon the previous stagnation, in consequence of obstruction; and this leading point has uniformly been insisted on by every succeeding author, whatever might have been his particular notion with regard to the nature of the obstructed fluid, whether bile, blood, or lymph; and even the anatomical structure of the part has been brought in support of the doctrine of obstruction. One of the latest writers,\* though he talks nothing of "coagulating acids,"† yet insists fully on this mechanical cause as the origin of cancer; "for," says he, "the circulation in the glands being carried on by a set of vessels much more minute than those with which other parts of the body are supplied, (let this be proved,) obstruction will much more readily and easily occur in them than in other parts."—"When the substance of a gland happens to be the part, a determination is made to this, being neither, as is found by experience, so proper as the cellular substance, for the formation of pus, nor, from its softness,‡ so susceptible of inflammation, as a membrane; an indolent hard swelling, called a schirrus, comes,

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\* Bell on Ulcers, p. 319.

† Dioni's Chir. p. 248.

‡ Does inflammation depend upon the hardness or softness of the inflamed part?

merely by the *obstruction* and *distension*\* of its different vessels, very naturally to be produced."

Some surgeons, perhaps from a desire of singularity, or from a defect of their organs of sight, declared, that they had detected little worms in the parts, which, eating it up, produced all the disagreeable symptoms of cancer; and that to their introduction the disease was owing. The cure which they confidently proposed, was applying a piece of cold veal to the part, which would tempt the animals to quit their devastation. Others, perhaps originally from ridicule, though latterly in sober earnest, told their readers, that there were no worms, but a little wolf in the part, which might be made occasionally to show its head, by holding a piece of meat before the ulcer.

Strange as this doctrine of living creatures producing cancer may appear, it is nevertheless adopted by a late very ingenious writer. When hydatids find their way into "a solid substance," the consequence, in his opinion, will be cancer; and the success of an operation will, he conjectures, depend, in a great measure, upon these animals being confined in a common cyst, for then they may be all removed; whereas, if they be unconnected, some of the smaller ones may be allowed to remain.† From the surface of the cyst, which contains the animal, a fungus shoots out, and thus acts as a barrier between it and the skin; or, if the animal have been in the stomach, it separates it from the coats of that viscus, "preventing suppuration in the one instance, and absorption in the other."‡ This suppuration, "and disposition

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\* One should expect, that the distension of the vessels would diminish the cause of obstruction, or remove it altogether.

It is rather unlucky, that the advocates for obstruction have made it the cause of simple inflammation, scrophula, cancer, &c.; and therefore all these diseases ought to be nearly, if not entirely, similar in their nature, and to require exactly the same means of cure.

† Adam's Observations on Morbid Persons, p. 184.

‡ Idem, p. 185.

to fungate before the skin is broken," if I understand him, is produced by the death of the animal; for, says he, "if hydatids possess the principle of vitality during their transparent state, and their opacity is the effect of the loss of that principle, would they not, in the latter stage, stimulate the part in which they are situated to suppuration, as we find the case with the Guinea worm when dead?"\* Concerning the manner in which these animals produce the symptoms of cancer, we are told, that "this enlargement of a foreign body, in a solid substance, and so extremely sensible as the breast, cannot but be attended with intense pain, and frequent inflammation."† A doctrine not far removed from that taught in the humoural schools, which maintained, that the coagulation and inspissation of the fluids distended the follicles of the glands, producing many cavities, and much pain.‡

That hydatids *may* be formed on a cancerous gland, I shall not dispute; but that they are generally to be met with, or are in any respect essential to the disease, I cannot admit. In all the cancerous breasts, testicles, and tumours, which I have examined, I never saw any thing which could be considered distinctly as a hydatid; so that I suspect, that under this name have been described the small cancerous abscesses, with thick cartilaginous sides, which we so universally meet with in schirro-cancerous glands. We likewise find cancer take place in circumstances in which no hydatids can be found. Thus, for instance, a cancerous wart being knocked off the face, a cancerous ulcer is produced; but no hydatid is to be found at the base of the wart to produce this.

When cancer has continued some time, it was believed that the matter was absorbed, taken into the blood, and that

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\* Adam's Observations on Morbid Persons, p. 181.

† Idem. p. 161.

‡ Van Swieten's Commentaries, article Cancer

all the humours were speedily assimilated ; and it was by this absorption and assimilation that they explained the fatal and rapid progress of relapses, after an apparent cure had been obtained. That matter is absorbed, is an undeniable fact ; but the only effect which is produced by this, is on the lymphatic glands,\* which intervene betwixt the sore and the heart ; for, beyond these, the matter does not pass *qua virus*, but is changed in its nature and properties, as is the case with every other part or production of the animal, which is absorbed and formed into part of the blood. Neither cancerous matter, nor variolous matter, nor syphilitic matter, ever are formed in the blood, or ever can enter into it, unless by means of a wounded vessel. This point I shall consider more fully, when I come to treat of the venereal inflammation. Here I shall only observe, that were the reverse true, then the contagious matter must pass through every gland, and every portion of the human form, in as much as the blood circulates in every point ; and, therefore, every spot should become diseased, and every part, in the same circumstances, should become diseased at the same moment.† Disease is not spread in the living system mechanically, by the absorption of matter, which is conveyed over the whole body, but by the sympathetic connexion of parts, which has

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\* Mr. Hunter supposes, that the mere absorption of schirrous substance before matter be formed, will affect the glands ; but it is difficult to ascertain the certainty of this, as small abscesses are formed very early. I have formerly mentioned, that every part of the animal is changed in its nature, at the moment of being absorbed : If so, schirrous substances lose all specific property, and cannot affect the glands. Pus, again, being a foreign matter, is absorbed unchanged, and continues so until it reaches the glands.

† It may be said, that different parts have different susceptibilities of assuming the morbid condition ; that the bones are longer of becoming affected than the soft parts, &c. Admit this, and still it must be explained, why every part of a similar structure, &c. should not be affected at the same moment. All the glands should become diseased at once ; all the bones should inflame at the same time ; and, instead of finding one or two organs affected, in consequence of the previous existence of a local disease, we should find the whole system rapidly becoming diseased.

been already explained, and which will afterwards be farther illustrated. It is in consequence of this, that a distant part shall become diseased, and yet all the rest remain healthy; and even where every part becomes affected, and a general disease is suddenly produced from a local sore, as, for instance, in small-pox, there is no diffusion of matter, nor is it ever conveyed beyond the lymphatic glands.

In this particular complaint, the consequence of sympathetic action, or the propagation of action, is sometimes the induction of the same disease in other parts; but most commonly the effect is the establishment of the hectic, or diseased formative action; for an explanation of which I refer to the dissertation on simple inflammation.

By examination, we find, that, in many instances, cancer is evidently produced by the same causes which are capable of producing simple inflammation; and, in every instance, I apprehend, that although the causes may be obscure, yet they are exactly of the same nature. It is, however, a general opinion, that this disease arises frequently from some unknown and mysterious cause which we cannot detect, and which, therefore, has been resolved into some constitutional taint, or cancerous ferment. But, so far as we know, the constitution is perfectly healthy in the commencement of this disease; nor is there the smallest proof that it resembles scrophula, in depending upon any peculiarity of constitution, before the causes operate.

Blows, bruises, and other exciting causes of inflammation, are apt to produce cancer; but, in many instances, we can detect no evident local cause acting directly on the part. In the breast, for instance, we frequently perceive cancer commence without the interference of any topical agent. In these cases, however, we may uniformly detect an irregularity or disappearance of the menstrual secretion. It was formerly observed, that the uterus and mammæ exhibited

very powerfully the sympathy of equilibrium; and it is upon this doctrine, which it is unnecessary farther to illustrate, that we are to explain the affection of the breast, which so frequently takes place in consequence of the cessation of the menses; for when the active state of the uterus is lost, the action of the mammæ is preternaturally increased, and a species of slow inflammation is induced. It is upon this principle only that we can explain why cancers are so frequent at the cessation of the menses.\* It is ridiculous to suppose that this discharge acts as a drain to the constitution, and carries off impurities, which would otherwise collect elsewhere, and produce local diseases. The breast is almost the only organ which becomes thus affected without any agent acting directly upon the part alone; for, in most other instances, we may detect the operation of such causes at least as tend to induce simple affections of the same part; but, in both instances, the *modus operandi* of the cause is alike, only circumstances are somewhat varied.

When the inflammatory action is slowly induced, whether by a bruise, or any other cause, acting directly on the part, or by sympathetic union with another part, we find, that the tumour which is consequent to this, seldom manifests a disposition to remove quickly, or assume the healing process. The part neither performs any distinct and acute inflammatory action, nor does it resume its natural condition and appearance, but remains in a new state, different from either, which I will call the state of simple schirrus.† If this state,

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\* It was supposed, that when the menses were obstructed, the impurities were sent by communicating vessels to the breast, where they lodged, and produced cancer. Vide, *Vesalii Opera*, p. 1092. *Fabricius de Tum.* p. 118.

Le Dran observes, that when schirrus, from any cause, takes place in the breast, before the cessation of the menses, it uniformly becomes more painful when any irregularity of that discharge occurs. Vide, *Memoires de l'Acad. de Chirurg.* tom. iii. p. 22.

† Warts are, with regard to their power of acting, to be considered in the same light with simple schirri.

which may follow the application of the common exciting causes of inflammation in any part, take place in cellular substance, or similar parts, which are possessed of no glandular structure, then a chronic tumour is produced, which is either slowly diminished by absorption, or at last unable to carry on its actions in perfection, being, in some respect, insulated, and deprived of the support of the surrounding parts;\* a diseased action, or morbid performance of its actions, takes place; a slow inflammatory condition is produced,† and at last ulceration succeeds. This, in general, forms pseudo-cancer, provided that the constitution be simple, that is to say, healthy: But if it take place in a scrophulous habit, the tumour is apt to become scrophulous, having its morbid actions modified by the morbid condition of the system. If this event take place in a lymphatic gland, instead of the cellular substance, then the tumour is still more apt to become affected with scrophulous inflammation, in consequence of even a very trifling scrophulous modification of the habit. If this state be produced in a secretory gland, the affection is somewhat different from that in simple parts, or those which do not secrete; because the inflammatory action becomes somewhat modified by the natural secreting action of the part; and, in this point of view, the gland may be considered as possessing a specific constitution, although the general constitution be simple; for, naturally possessing a peculiar mode of action, it follows, that new actions induced in such a part, ought to be performed in a different manner from the same actions in parts which naturally do not possess this peculiarity, and that the actions ought to be specifically different. When these parts are at-

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\* See the Note to p. 154.

† The simple schirrus now assumes that specific mode of inflammatory action which it is to continue, and may now be called the scrophulous or cancerous inflamed schirrus.

tacked with acute simple inflammation, it differs from inflammation in the cellular substance in certain circumstances, and particularly in being much more tedious; but when the nature of the part is still farther altered by the accession of a slow inflammatory action, which operates in the manner above described, then it assumes a specific inflammation, which ends in ulceration. The exact, or specific nature of this, is various; and the state, which we call cancerous, is probably only one of the varieties of this morbid inflammatory action; and whether the part shall assume this variety, or some other variation, as, for instance, pseudo-cancer, depends probably upon local circumstances, which we cannot as yet detect or explain. If, however, the constitution possess any specific mode of action, the tumour generally assumes nearly the same mode; and, therefore, in scrophulous people, these tumours more frequently become affected with scrophulous inflammation, than with cancer: At the same time, if the previous change on the gland, induced by the slow inflammatory condition, have been great, the scrophulous condition, which it possesses in common with the rest of the system, becomes modified in it, in the same way as the simple condition, in healthy habits, is modified by the new or schirrous state of the gland; and, therefore, the scrophulous inflammation is sometimes different, and the ulceration more fungous than in other parts.

The causes, then, of simple inflammation, when they operate slowly, or leave the part in a state neither inflamed nor healthy, give rise to a chronic enlargement, and change of nature, which I have called simple schirrus.\* This per-

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\* Schirrus has generally been enumerated as one of the terminations of inflammation; but it cannot, properly speaking, be considered as such. There are only two kinds of termination, one in death, as, for instance, gangrene; the other in recovery, which is accomplished either directly by resolution, or indirectly by suppuration. Schirrus is not produced by a perfect and complete cessation of inflam-

forms, like every other part, certain actions, which are intended for its own support, and which must make a part of the general action of the system, or be in unison with the rest of the body. But as its actions are different in nature from those which any part of the body naturally ought to perform, and as originally this organ, (which, from the changes induced on it, is to be considered as new and extraneous,) formed no part of the human frame, there is not that connexion betwixt it and the rest of the system, which is necessary for its support. It, therefore, does not derive the same aid and support from the neighbouring parts which natural organs do, (for no part, or individual organ, can exist and support itself singly, and independent of the rest,) and, accordingly, must soon come to suffer. It is unable to perform its necessary actions in perfection; they become morbid, and of an inflammatory nature. The tumour is now an inflamed schirrus; and this inflammation either assumes a modification, from the specific nature of the constitution, or from the peculiar nature of the tumour itself, which, as has been explained, is different from the healthy state of the tumid part. We have, therefore, the scrophulous, the cancerous, the pseudo-cancerous inflamed schirrus; and the symptoms of these different kinds of schirri, and the appearance of the ulceration, will, *cæteris paribus*, be modified by the nature of the part affected. The same disease, therefore, exhibits slight variations in different organs, as has been described in the history of cancer, and might, therefore, were we inclined to multiply distinctions, be considered as so many different diseases.

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mation, but by a continuance of a low degree of inflammation, which renders the state of tumefaction which attends it natural to the part, before it goes off. This state, then, is not a termination of inflammation, but a consequence of its continuance.

This disease is most apt to take place in elderly people, (in so much that some consider it as peculiar to old age;) because in them, parts sustain injury of their actions worst, or are less able to recover from them. Hence, two consequences follow: First, Simple schirrus is more easily produced, resolution of inflammation being more difficult, especially in parts which are, at all times, rather tedious in their recovery, when inflamed: Second, The simple schirrus is more apt to inflame, or have, what may be called, *its* necessary actions impeded and deranged. It must, however, be remembered, that there is no age whatever exempted from this disease: I have seen it distinctly marked, and attended with a fatal event, in children of five years old.\*

It is a controverted point, how far it is possible to produce cancer by inoculation; some maintaining, that the application of cancerous matter to a sound part will induce the disease; others, that it is altogether harmless. Analogical evidence is certainly in favour of the first opinion; because the majority of specific ulcers may be inoculated, and have been so by accident. But, at the same time, it must be admitted, that there are few well established cases of this particular point. We find, however, that, like the venereal matter, the cancerous, when absorbed, induces a disease in the lymphatic glands, of a cancerous nature. We would, therefore, be led to conclude, that if the matter be capable of inducing cancer by absorption, in a distant part, it ought likewise to be capable of producing the same disease in another person by inoculation. The same may be said of the spongoid inflammation, &c.

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\* I have known two cases of this kind; in both the eye was affected. One boy had his eye extirpated; but a small part being left by the surgeon at the angle, the disease returned, and proved fatal. In another, the disease was in its incipient stage; but the relations would not submit to an operation.

From these observations, it will, I presume, appear, first, That when a part is incapable of performing the actions necessary for its preservation in a state of health, it generally slowly assumes the inflammatory state, which goes on to ulceration; but the part being unable to support its natural action, can much less perform the actions necessary for restoration from this morbid condition, which, therefore, continues permanently and progressively increasing; that the nature of this unhealthy action is not always the same, but admits of variations dependent upon certain conditions in the previous state of the part affected, with regard to which we are greatly in the dark. Cancer, pseudo-cancer, spongioid inflammation, &c. are some of these variations.

Secondly, Cancer, and all these variations, are originally, in the strictest sense of the word, local diseases, depending neither upon any constitutional affection, nor the presence of any general cause. They do, however, in progress of time, affect not only parts in their vicinity, but also the system in general, producing, by means of sympathetic actions, specific hectic affections, as has been formerly explained, when treating of simple hectic. They likewise spread over more surface in the part at first affected, and produce the same morbid actions without variation, by means of the sympathia consociationis serpens. They also induce a similar disease in the nearest lymphatic glands, by absorption.

### *Of the Prevention and Treatment of Cancer.*

From what has been said, it will appear, that cancer is to be prevented by using the most vigorous means for the removal of simple schirri, upon their first appearance. Of these, local bleeding is the most powerful, and ought to be freely employed. Next to this, an issue in the neighbourhood of the part ought to be most depended on; and these

two remedies must be employed early, and continued carefully. Whenever a simple schirrus arises, we ought to be on our guard, in whatever situation it may be placed; but, if it occupy a secretory gland, we require to be doubly vigilant. This, at first, is not painful, at least the patient only complains of slight uneasiness shooting for a moment through it. This circumstance too frequently prevents the patient from attending to it; for where there is no inconvenience sustained, there is little inducement to apply for assistance; and, not unfrequently, an ill-judged modesty contributes to this delay. But although the patient may be little concerned at this period, yet the surgeon must not observe the same indolence. Aware of the dangerous consequences of allowing the tumour to follow its natural course, he will apply leeches once and again, and insert an issue as near the part as possible. The remedies called discutient have been much recommended at this stage; such as sal ammoniac dissolved in vinegar; and this is sometimes useful, but perhaps not more so than the vegetable acid by itself; When it does not interfere with bleeding, it may be usefully employed. By means of these remedies, we may frequently remove recent tumours, which depend merely upon the enlargement of an organ, without any other considerable change of structure. But it is more difficult to remove tumours which are not produced by the mere enlargement of a part, but depend upon a change of structure, or the formation of new parts; as, for instance, warts, polypi, &c. The small indolent tumours, however, which take place in the cellular substance, may sometimes be removed by the early use of these remedies.

When these means have either been neglected, or fail when employed, and the schirrus begins to inflame, there is little hope of performing a cure by either local or general applications; and extirpation affords the only chance of re-

covery which can be depended on. But, as it is not always at the very first certain that the schirrus has assumed the cancerous inflammation, and is not curable, the operation ought not to be advised in the first instance, or upon the very first appearance of the pain, or symptoms of commencing inflammation; on the contrary, we ought to have recourse to local bleeding, the use of issues, mild diet, and perhaps the use of cicuta; but if these remedies do not evidently arrest the progress of the disease, diminish the pain very considerably, and make the tumour perceptibly softer and less, in the course of a few weeks, we ought, without hesitation, to advise the removal of the part, which I shall presently consider.

The local bleeding is to be performed with leeches, which are preferable to the scarificator, being attended with less irritation. Three leeches may be applied to the part every second day, as has been proposed by some writers on this disease. This practice must be continued for a considerable time; and, during the intervals of bleeding, cloths dipped in cold water ought to be applied. If, in the course of a month, the tumour becomes freer from pain, and softer, we may apply the leeches only every third day, and continue this for another month, and afterwards either persist for some time longer in the same way, or repeat the application at longer intervals, according to circumstances. But if, on the contrary, the tumour become rather larger, and more painful, as sometimes happens, when the disease is farther advanced before we begin, and if the constitution suffer by the repeated evacuations, we must desist.

Issues may be formed, either by introducing a small seton superficially on each side of the tumour, or by blistering the part, and afterwards keeping it open with savine ointment. The latter of these methods is not admissible, when the disease has proceeded so far as to make the skin adhere to the

gland and become puckered ; indeed, at this period, issues formed in any way ought never to be advised, unless the operation will not be consented to ; because the chance of their producing a cure is very little, and we lose time by trusting to them.

Mild and spare diet has a very considerable influence over this disease, in almost every period, and contributes greatly to retard its progress. It ought therefore rigidly to be conjoined with the bleeding and issues, in the commencement of the disease, and will tend to abate the action in the part, and promote its resolution. The diet ought to consist of stewed apples, or prunes, panada, and weak broths, with bread. It has even been proposed to prohibit almost entirely the use of solid food, and to allow the patient nothing but water for the course of several weeks. This was much recommended by M. Pouteau, who was led to make trial of it by the success attending the empirical practice of an ecclesiastic. It was afterwards enforced by Callison ; and more lately abstinence has been favourably mentioned by Mr. Pearson, who relates some cases of cancer, or appearance of cancer, in the uterus, in which it produced very astonishing effects, abating the pain, diminishing the swelling, and re-establishing the general health.

By means of these remedies, we may sometimes succeed in removing by degrees a schirrus, after it has evidently begun to inflame, and threatens to become cancerous. But if, notwithstanding these remedies, the disease evidently continues to increase, or if, in the course of a few weeks, they do not produce an evident effect, we cannot with propriety delay the operation, which is the most certain method of cure, and one which succeeds in a majority of instances, if early and properly performed ; nor ought any other method of treatment to be proposed in opposition to it, unless in the very commencement of the inflammatory state ; and it is in

this period only that I propose the above treatment, unless the patient absolutely decline the operation; for when the skin becomes puckered, and the inflammation has continued clearly for a considerable time, without any measures being taken to remove it, the success of any local or general remedy is exceedingly precarious, and delay is not only useless, but frequently dangerous. It has, however, been doubted by some very ingenious surgeons, whether it was proper to advise the operation at any period, they believing, from the number of relapses, that it was almost useless; whilst others have been against the early performance of it, on the principle, that some parts already diseased might not have, at this period, become evidently affected; and, therefore, might inadvertently be allowed to remain.

The late Dr. Monro,\* from observing, that almost all the patients on whom, to his knowledge, the operation had been performed, relapsed, is inclined rather to adopt the palliative treatment, than the extirpation. He takes for granted, that, in the generality of cases, cancer depends upon some internal cause. In these cases, he is decidedly averse from the operation, and advises it only when the disease occurs owing to blows or hurts in young and healthy people. But, in considering this opinion, we are to remember, that a great many of these cases may be supposed to have been very far advanced before any operation was performed; and likewise, that the method of operating, in that period, was extremely unfavourable to a cure, the wound being kept open, and suppurations and ulceration rather encouraged than avoided. More lately, Mr. Hill of Dumfries has published an account of cases, where the operation was performed in more favourable circumstances, and of these not a seventh part suffered a relapse. The present Dr. Monro gives even a more favourable

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\* Med. Essays, Vol. V. p. 422.

account; for, if I am not much mistaken, he observes, in his lectures, that not one-third of the cases in which he had been consulted, had relapsed. From my own observations, I cannot judge very accurately; because many of those on whom I have operated, came from parts at a great distance, and with which I had no intercourse; consequently, I could not hear of the result of those cases: But of the cases, the sequel of which I have heard, not a fifth part have relapsed; and in those the operation was performed at a period when the axillary glands had become diseased, but were not evidently so; and, therefore, were not extirpated; for, in all of them, the disease reappeared in the lymphatic glands. But, even from this relapse, the patients may be cured by a second operation. We may, therefore, conclude, that, if the operation be early performed, the majority will recover; and even although the disease should afterwards appear in the lymphatic glands, the patient is not incurable; for we frequently succeed in extirpating cancers, when the glands are very much affected before we are applied to. I have operated in cases where I was obliged to dissect the glands, from the axillary artery along almost all its course in the arm-pit, and which reached well nigh to the articulation.

With regard to the argument against the early extirpation, founded upon the possibility of the disease having affected parts in the vicinity, which have not yet evidently become diseased,\* I may observe, that, upon the same principle, we ought not to operate until the axillary glands swell; because they may be affected, although they be not yet evidently enlarged; and, therefore, may give rise to a relapse. If we only remove the single gland in the breast, which is hard, we doubtless run a great hazard of a relapse; but, I apprehend, that this ought never to be done, and that

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\* Pract. Obs. on Cancerous Complaints, by Mr. Pearson, p. 50.

the whole of the glandular part of the breast ought to be removed at once; because we thus more certainly prevent a return of the disease, which we cannot otherwise, with any certainty, do. The additional pain is very inconsiderable; and we can derive very little advantage or benefit from leaving a part of the mamma behind.

The caustic has been proposed, instead of the knife, for the removal of cancer or schirrus; but it is much less certain, more tedious, and even more painful. Instead, therefore, of recommending itself to timorous patients, this practice is still more to be dreaded, than the excision, which is more terrible in anticipation, than in the actual performance of it.

The caustic most commonly, and indeed almost universally, employed, is arsenic mixed with various inert substances, and formed into a paste or ointment.\* This has been applied in two ways; first, directly upon the skin, covering the schirrus, and then, after this is destroyed, upon the schirrus itself, destroying it layer by layer; second, directly upon the skin, and then, instead of applying it to the gland, to put it round it on the surrounding cellular substance, and by gradually destroying this round the gland, to turn out the schirrus entire. This was the practice of Mr. Guy, who gained considerable credit by his success; and, since his time, it has occasionally been performed with success by some others.†

\* Arsenic mixed with sulphur, and powdered crow-foot, and made into a paste with yolk of egg, forms Plunket's composition. Mixed with forty times its weight of powder of belladonna, it forms an application which some time ago was much in repute in North America.

† Justamond on Cancers, p. 141. This gentleman relates a case, in which, by destroying the skin with lunar caustic, and then applying arsenic, he removed the gland. The arsenic, in this instance, was fused with antimony, in proportion of two parts of the first to one of the last. This was powdered and mixed with equal parts of powdered opium, and made into a liniment with yolk of egg.

This method, however, is liable to several material objections : It is uncertain in its issue ; for, if the gland be not completely removed, the disease makes a rapid progress afterwards. It frequently happens, that some smaller glands around the large one are affected ; and these are greatly irritated by the action of the caustic in their vicinity : It is more painful than the operation with the knife ; and the subsequent process of healing, even granting the method to succeed in removing the diseased part, is much more tedious than when the incision is employed, and union by the first intention procured.

On all these accounts, but most especially on account of its uncertainty, the method of cure by caustic can never be sanctioned by any modern surgeon, much less can it ever be held up in opposition to extirpation by the knife.

This practice, which has had many advocates for its employment in schirrus, has been equally recommended in cases of cancerous ulcers ; but here it is still less admissible ; for the extent of diseased parts is generally greater ; the neighbouring parts are affected to a greater distance ; indurated and diseased lymphatics frequently extend from the breast to glands in the axilla. It is, therefore, next to impossible to turn out the morbid parts, as “ nuclei,” by destroying the substance around them ; and it is equally improbable that we shall, unless the sore be very small, and the caustic very strong, be able to make it slough off in successive layers. Farther, we can propose no advantage to ourselves, from employing caustic in preference to the scalpel ; because in every instance in which we can destroy the parts by means of this, we can equally safely, infinitely more speedily, and with much less pain, remove the parts with the knife. There is only one case in which caustic is useful, and that is merely as an appendage to the operation of excision. When we dissect off ulcers from parts where, owing to the want of

cellular substance, the skin is not lax enough to be brought over the parts, or when so much of this has been removed, that, although lax, it cannot be made to cover it, we may find it of service to rub the bottom of the wound with lunar caustic, as we thus stop the oozing of blood, and destroy any little portions of the diseased part which we may have left.

For the purpose of destroying cancerous ulcers, many caustics and escharotics have been proposed, such as the arsenic, corrosive sublimate, lunar caustic, &c. Of these no one seems to possess a preference over the rest, if we consider only their local action; but some of them, especially arsenic, are apt to produce bad effects, and that very unexpectedly, on the constitution.

After making these remarks upon the method of cure, I shall conclude with some observations on different remedies, which have been proposed as palliatives, where the operation is not admissible, or will not be consented to, and which have even been supposed capable of changing the mode of acting altogether, and producing of themselves a cure. These remedies I shall divide into general and topical.

Of the general remedies, those which have been most frequently, and with the greatest confidence, employed, are narcotics, such as the cicuta, opium, night-shade, &c.

The cicuta is a medicine which was, at one time, in very high repute, and owed its reputation to the experimenting talent of Storck, who has written several libelli on this plant. According to him, cicuta possesses very evident powers over cancer, and has cured a great many cases; but, in less prejudiced hands, it has been much less successful; and even in many of the instances adduced by Baron Storck of its utility, it is by no means proved, that the disease was really cancer. The present opinion of the public seems to be very unfavourable with regard to this medicine; and from

the numerous instances in which it has failed, this opinion seems to be very just. Along with the proper local applications which have been formerly noticed, it sometimes is of service in removing simple schirri;\* but I have never found it of any service when the schirrus had assumed the cancerous inflammation, much less when it has proceeded the length of ulceration. In the last case, I have never found it even produce the temporary melioration which many talk of.

The common way of exhibiting the hemlock, is to begin with small doses, and increase these gradually, until they produce vertigo: For this purpose, we may begin with two grains of the extract, or four of the powder, recently prepared, twice or thrice a-day, and gradually increase the quantity.† In this way, we find that some patients have come to take an ounce of the extract daily; but if a much less quantity than this produce no good effect, we may consider it as useless to continue a remedy, which, in this dose, must injure the constitution every day that it is continued. On the continent, the hemlock has been used in the form of a bath; but it is so disagreeable, that few can be brought to use it.

The belladonna has been much recommended by Lambergen, who tried it in many cases of cancer; but these trials, when repeated with attention, have not been greatly in favour of the remedy. During its use, he kept the bowels open with clysters, administered every second day. The dose, at first, ought to be a grain of the dried leaves, made into a

\* If I am not mistaken, the present Dr. Monro mentions, in his lectures, one instance, in which a small schirrus appeared to be removed by it; but whether this was simple or cancerous, I do not know.

† As different parcels of this medicine may not be of the same strength, it is prudent, when we begin a new supply, that we diminish the dose at first, if it have formerly been very considerable. By not attending to this, fatal effects have followed.

pill. This, in the beginning, is to be given morning and evening, and afterwards more frequently.

The hyocyamus has also been frequently used in cancer, and was very much in repute with the ancients. I have tried it occasionally, but with very little effect. The dose with which we begin, is two grains of the extract.

The aconitum is a more powerful and dangerous narcotic, in so much that a quarter of a grain of the extract is generally the dose with which we begin.

The solanum dulcamara, Paris quadrifolia, phytolacca, &c. have been likewise recommended and employed, but are now so little used, that it is unnecessary to take any notice of them here.\*

The laurus cerasus is a very powerful narcotic, and has been used, in this particular complaint, by Richter, but with very little success. The most common preparation of this medicine, is the distilled water; but the dose of this is very uncertain. Some have, therefore, proposed to give, for a dose, four or five grains of the fresh leaves infused in a little water.

The digitalis has a considerable power of abating vascular action, and may, therefore, be of use, in the same point of view with abstinence, bleeding, &c. in abating the action of schirri; but concerning its real utility in this disease, I cannot say any thing with certainty.

Opium is seldom employed with an intention of curing this disease, although it is probable, that it possesses just as much power over cancer, as those other narcotics which have been more frequently used. It is, however, liberally employed with a view to abating the pain of cancerous ulcers.

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\* I have tried the hepatized ammonia, but without any benefit.

Tonic remedies have frequently been used in this disease ; but although they may sometimes improve the general health, yet they never produce any effect upon the local disease. On this account, they are now very seldom employed.

Arsenic is a medicine, which has, by some, been considered as a specific against cancer ;\* but even those who maintain this, add, that although they *believe* and *think* so, yet they have not been able to administer it in such quantities as to produce any good effect.

Mercury† has also been recommended ; but there is no fact more certainly ascertained than this, that mercury uniformly exasperates this disease, especially when it has proceeded the length of ulceration. In this case, the sores enlarge rapidly, become much more painful, and bleed frequently. It is worthy of observation, that those who are affected with cancer, have in general the mercurial action induced very easily and very speedily ;‡ and the changes which take place on the ulcer are equally rapid. This circumstance, of mercury increasing the disease, in so marked a manner as it usually does, ought not only to make surgeons careful of exhibiting this remedy, upon slight suspicions of the sore being venereal,|| but may likewise be attended to as a step toward the discovery of a better mode of treatment for cancer than we yet possess ; because if, at any time, we discover the means of directly displacing and counteracting the mercurial action, we may perhaps find the same to be useful in abating the cancerous ; these two actions appearing to possess some general coincidence, from their mutual effect in increasing each other.

\* Justamond on Cancers.

† Along with this, it was customary to prescribe decoctions of gæaiac sarsaparilla, &c.

‡ It likewise continues very long after giving up the use of the mercury.

|| Some cases of this kind I have already mentioned.

Copper, in the form of *cuprum vitriolatum*, has been used in cancer; and one case is recorded, in which it is said to have produced a cure; but in every other case it has failed; and, from the violent effects which it is apt to produce, considerable danger attends its exhibition.

Muriated barytes has been proposed as a cure for this disease; but now none employ it with this expectation.

The same remedies which internally have been supposed to cure cancer, have also been proposed as local applications.

Among the older practitioners, narcotics were very currently employed as a dressing for cancerous sores. Vesalius used cloths dipped in the juice of the solanum; whilst others employed it mixed with oil of roses, and preparations of lead and antimony. Others had recourse to the hyocyamus; whilst of late the cicuta poultices seem to have superseded the use of most other narcotic preparations. These have, undoubtedly, in many cases, abated the pain, and diminished the fœtor; but this is all which can reasonably be expected from them; and even this expectation will not always be realized.

Carrot poultices are still more useful, as they possess the property of abating the fœtor, in a degree superior to the hemlock, and give generally as much ease. This fœtor has been long compared to the smell of *hepar sulphuris*, and lately has been supposed to arise altogether from the formation of a substance of this nature, consisting of sulphur and volatile alkali. As it has been too much the case in medicine, to overlook causes, and attend to effects, so we are not to be surprised if we find some physicians proposing to cure cancer, by remedies which shall decompose the matter which is yielded in that disease, or destroy the effect of the morbid action, whilst the action itself is overlooked.\* From

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\* Although the fœtor may depend upon the presence of hepatized ammonia, yet

experiments made upon the hepatized ammonia, it was found, that the oxygenated muriatic acid was the best agent for decomposing it, and destroying its smell. This fluid was, therefore, highly recommended as an application for cancerous sores; and, in many instances, it will indeed be found to correct the fœtor, which is certainly one advantage; but it never will perform a cure.

Carbonic acid has been said not only to correct the fœtor, but also, in some instances, completely to cure the disease. It was long ago proposed by M. Peyrilhe, and of late it has again been brought forward by Dr. Ewart, who has published a case in which it produced cicatrization; but although, upon his recommendation, it has been frequently employed, yet it has very seldom been of any considerable service, and I have heard of no instance in which it produced any permanent amendment. It would rather appear, that the opinion of M. de Fourcroy was the just one: "After the first applications, (says he,) the cancerous sore appears to assume a more favourable aspect, the sanies which flowed from it becomes whiter, thicker, and purer, and the flesh has a redder and fresher colour; but these flattering appearances are deceitful, nor do they continue long, for the sore speedily returns to its former state, and its progress goes on as before the application." The best method of applying this, is by means of a bladder, the mouth of which is fastened round the sore, by means of adhesive plaster. The air is introduced by a pipe inserted at the other end. When first applied, the gas produces a sensation of coldness, which is soon followed by a glowing heat, and abatement of the peculiar pain of the sore. At other times, it, from the first, produces a smarting, and makes the patient rather more un-

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this does no harm to the ulcer. On the contrary, I have sometimes found the application of this fluid, when mixed with water, have the effect of abating the pain.

easy. This is especially the case if we use the fermenting poultice, instead of the air already extricated.

Digitalis, applied either in poultices or infusion, has been said to abate the pain, and meliorate the appearance of the sore; but, in this respect, it seems to be very much on a level with cicuta.

Tar ointment, gastric juice, absorbent powders, and many other applications, which it is unnecessary to enumerate, have been proposed; but as their utility is by no means evinced, I shall not detain the reader with any remarks upon them.

Caustic, and escharotic preparations, have been already considered.

Upon the whole, when the ulcer does not admit of being extirpated, all which can be done, is to keep the sore clean, by washing it carefully, and dressing it with some mild ointment, or using some of the poultices or lotions already mentioned, if these do not gall the skin, at the same time that we keep the patient easy by administering opium.

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Having now concluded these observations on the cancerous inflammation, I should next proceed to the consideration of the venereal inflammation; but the dissertations on this subject must be reserved for another volume.











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